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### COVER STORY

Courting Disaster: The IBM PC AT

John Dickinson/Fact: IBM AT hard disks fail with alarming frequency, plunging megabytes of valuable data into "Disk Boot Error" limbo. Even dyed-in-the-Blue IBM admirers are fed up. Examples? Among PC Magazine's editors alone (and we are not alone), five ATs have trashed a total of 12 drives. That's 140 megabytes. Worst of all, IBM's official response to the wildfire epidemic is "No

From Sea to Shining Sea . . . Charles Bermant and Bill Howard A litany of AT disasters from users and dealers across the country. Also, CMI (the beleaguered hard disk drive's manufacturer) responds ...... 115

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Christina Dyar/For those who can live without the IBM alternatives, including power



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# PEREE

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WHAT'S INSIDE



When IBM introduced the PC
AT nearly 2 years ago, we were
surprised and impressed. The
AT was a real breakthrough,
which was unusual for IBM, a
company better known for its
savy marketing and outstanding service than for product innovation. While the competition was busy making slightly

faster PC clones, IBM's new AT came equipped with a fast (6 MHz was fast back then), advanced-technology intel 80286 processor, high-performance 20-megabyte hard disks, and 1.2-megabyte-360K-byte floppy disks. It could even run Microsoft's mulsuer UNIX version, XEMIX. What more could an office full of

PC-de-predient overachievers possibly ward?

A reliable computer, that's what. When early reports of AT hard disk failures landed in our mailbox, it looked like the normal frameign up' problems any company lines with a new machine. The company that virtually invented quality control. As reasoning from the company that virtually invented quality control. As reports of AT disk failures persisted and grew, however, we became cornered. When troubles starks on PC Magazine's home tart, we became cornered concerned, and when the trouble and 18Ms 'nowy assur-corned. When troubles starks on PC Magazine's home tart, we became more concerned, and when the trouble and 18Ms' story assur-

The AT's problems have users and dealers from coast to coast countring disaster, and in this issue PC Magazine covers all the angles. Read our horror stories, get the dealer perspective, hear out IBM, and check out the alternatives we describe. It all begins on page 106.

4 "Also in this issue, Charles Petzold presents DISKSCAN, a much-needed utility program that routinely monitors your disks 7 and reports on the problems it finds (page 241). On page 203, Car-2 ol Day explains your options when things go wrong and your PC 6 needs serious repair.

Dara Pearlman, Diane Burns, and Sharyn Venit review mailmegres in nine poular word processing programs (see page 165). Though often cumbersome, these important word processing tools are much more powerful than you might expect. Speking of cumbersome, you may remember how poorly Okidata's new Microline printers fared in last year's printer issue. Okidata heard our complaints and made substantial improvements to the printers, which have therefore earned a second look (page 147).

It's easy to be hard on IBM because we expect so much from its products. But it's tough, too, because, despite their problems, we're not about to toss our ATs out the window. Executive editor Paul Somerson explains why in "How Much Is That Logo in the Corner?" on page 109.

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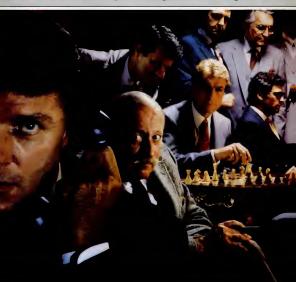
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### LETTERS TO PC MAGAZINE



### WORD OF MOUTH

WordPerfect is! Your comprehensive (Herculean, I might add) special issue on word processors ("The Business of Words," PC Magazine, Volume 5 Number 2) was both timely and well done. As a former corporate and legal word processor, currently a book writer and president of a corporate word processing training



company, I have great admiration for both the editorial management and astute analysis by your reviewers, which shows from conception through to detailed execution in the special issue. But, in my opinion, WordPerfect 4.1

should have been included in the corporate list as a legitimate contender for top bonors in the corporate as well as professional category. It's a true crossover ("perfect" as your reviewer said) program.

Kenneth R. Kappel New York, New York

New York, New York

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processing program Allegory ("The Business of Words"), since it confirms our

pride in Allegory.

There was one glaring problem, however. The editing screen pictured in the Expanded Fact File (page 103) conveys a misleading impression of what Allegory is all about. In the screen, Allegory appears

to handle text on a line-by-line basis without automatic up-to-the-moment formatting. What happened was that when the reviewer exported his original Allegory document to an ASCII file, that file was reimported into Allegory by PC Magazine.

reimported into Allegory by PC Magazine for photographing. When using all but the simplest word processor, this procedure results in the unavoidable loss of some original formatting information, since standard ASCII doesn't provide for all word processing information.

The format line remains as it was set during the importation process, not as it would be for working with the document, and tabs were unnecessarily replaced by

spaces.

By the way, our new address is as follows: April Software Inc., 6728 Fair Oaks Blvd., #403, Carmichael, CA 95608.

rmichael, CA 95608. Scott Brownlic April Software Carmichael, California

#### WORDS UNDERGROUND

book.

You had an intriguing article in your January 28 issue entitled "Handy with a Wrench? Try Do-It-Yourself WordStar" (PC Magazine, Volume 5 Number 2), a review by Ward Starr and Mel Murch.

Hofortunately Loud find no mention

review by Ward Starr and Mel Murch. Unfortunately, I could find no mention of the publisher or any suggestion as to where I might be able to purchase their

> Ronald J. Pierce Bellingham, Washington

There's only one source for Underground WordStar-directly from Ward and Mel themselves. This cult classic bookdisk package on customizing every last feature of WordStar and uncovering its undocumented features goes for a mere \$19.95

plus \$2 for first-class postage. Write Hard/Soft Press, Box 1277R, Riverdale, NY 10471, —Ed.

#### PC INTELLIGENCE ARTIFICIAL? In Jeffrey Rothfeder's article, "Is There

Intelligent Life in the PC?" (PC Magazine, Volume 5 Number 1), he describes using the query

"What do you think about war?" in Logic-Line Series I. The program retrieves the quote "I hope it will not be thought disrespectful to those gentlemen



if, entertaining as I

do opinions of a character very opposite thesis. I shall speak forth my sentiments freely and without reserve." and then he claims this extract has a "more abstract connection" to the query. What connection? Is there any query whatsoever to which his extract could not be understood to which this extract could not be understood which this extract could not be understood which this extract could not be understood the lift an extract extually had no such abstract connection? If such appurent not sequitures can be considered to have a connection with the query, how would once the fire program was working properly if the program was working properly and

If the program could actually do anything more than find actual word occurrences, certainly it should be able to find near or exact synonyms, such as freedom and liberty.

When we tried a straight word search in found no references to liberty. When we did a straight search using the word liberty, it found no references to freedom. A straight word search on the word codfish.

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#### VIEWPOINTS

### ■ LETTERS

by the way, came up with several passages of extracted text, none of which contained the word.

The second file in the manual (which by the way is very bad) contains the word freedom, but if you replace that file with one containing the word liberty, remarkably, you obtain the exact same results. The program works! But wait a minute-what happens when you replace that second file with one containing the word codfish? Again, the exact same results. How about a null file, containing only the required delimiter? No surprise, the exact same results. Peter Kassan.

Paul Goldenberg. and David Wolk Brooklyn, New York

Jeffrey Rothfeder was right on target in "Is There Intelligent Life in the PC?" It's unfortunate that so many reporters have swallowed press releases infected with "artificial intelligence" hype. I might believe artificial intelligence is in the realm of possibility if a computer can be designed and programmed to drive me from La Guardia Airport to midtown Manhattan during rush hour, entertain me with stories about New York City, make change for the fare, and recommend a good restaurant.

Forrest M. Mims, III Seguin, Texas

Jeffrey Rothfeder replies: I don't disagree with the gentlemen from Brooklyn about Logic-Line Series 1, but they're taking my comments out of context. The Patrick Henry statement is connected to the query only because the program, as I mention in the article, provides two responses. One is: "The war is inevitable-let it come! I repeat it, sir, let it come." The second statement, quoted above, is important because it indicates in an abstract, nonliteral way that while many in the group may oppose war, he does not. It's not a non sequitur but a further explanation of Patrick Henry's position. Forefathers aside, I agree Logic-Line leaves much to be desired. Artificial intelligence doesn't yet exist on the PC. and if a program-even one that promises more-seems less than smart to them.

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### THE MOUSE THAT ROARED

In the article "Operating in a New Environment" (PC Magazine, Volume 5 Number 4), the Microsoft Mouse is referred to as "the most popular mouse for the IBM PC" and in "Building a Better Mouse Interface" (in the same issue) as "a de facto standard."

It is pretty widely accepted that there are two mice for the IBM PC and compatibles that have established themselves in

Designing a mechanical mouse involves

frustrating trade-offs between accuracy and the

need for periodic cleaning and between

mouse life and cost.

the marketplace: the other one is Mouse Systems's PC Mouse. This acceptance is reflected in the fact that software developers, including Microsoft itself, uniformly support both.

It's noteworthy that there are differences in optical and mechanical mouse technology. Designing a mechanical mouse involves frustrating trade-offs between accuracy and the need for periodic cleaning and between mouse life and cost. Despite the efforts of mechanical mouse manufacturers to minimize these shortcomings, many users in search of a clean surface with consistent friction are buying mouse pads.

mouse pads. The optical mouse, which is the kind we make, is only part of the trend toward the use of optical and electronic technology in applications as diverse as supermarket scanners and high-fidelity recordings. Just as compact disk recording is inherently superior to a compact disk recording is inherent justical to the proper superior to the proper superior to the proper superior to the delity and life, the optical mouse has fundamental advantages over the mechanical mouse in its design. Rather than depending on the accurate retain of a steed ball rolling across a surface, the movement of an optical mouse is measured digitally, relative to a grid printed on its pad. Since no moving parts are involved, the optical mouse moves smoothly and noiselessly, requires no cleaning, and has a much longer life.

Robert V. Dickinson President, Mouse Systems Santa Clara, California

### FAN OF THE BEST

The January 14 issue of PC Magazine (Volume 5 Number 1) was one of the best ever! "The Best of 1985 (and Some of the Worst)" was fascinating reading, and the two in-depth articles on memory and copy-protection systems were well-done pieces on the right subjects.

Joseph Williams Brussels, Belgium

### CORRECTIONS

In "Demo Programs Simulate Software, Aid Teaching" (PC Magazine, Volume 5 Number 3, page 46), Software Recording's Antichlentor was listed as costing \$2,500, including a recorder, a run-time version, and 100 run-time modules. The recorder alone costs \$895, and players to run that tare cost \$100 each.

In "The Copy Protection Wars" (Volume 5 Number 1) Ashton-Tate's Framework and MASE III are listed as using the "key disk" method of copy protection. Only Version 1.0 of both products used that technique. Ashton-Tate now uses the Softguard system, which allows for hard disk installation.

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criticism about something you've read in OPC Magazine', A question you'd like to open up to other readers? Then send you opinion on paper of diskette to Letters to PC Magazine. PC Magazine. One Park Ave., New York, NY 10016, or send your opinion through MCI Mail to PCMAGA-ZINE at address 157-9010. We read you we're not able to answer letters personally. All letters become the property of PC We can't print letters that do not include a name, address, and phone number for wefficiation.

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### **PC** ADVISOR



The PC Advisor helps readers choose the hardware and software products that are best suited to their specific needs.

### AN EXPANDING DATABASE

I've set up a database with PFS: FILE and am frustrated by its inability to handle new formats. I want to change the way some of our files are stored; I have three people who enter records daily.

Mike Ullheim Paramus, New Jersey

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Q&A (Symanter Carp., Cupertina, CA 98014; (408) 25:9600; 3290 Boa a cammand structure that's very similar ta PFS's, and it caudd be just enough of a step up the ladder 'you've inversed much time in employee training (see ''Q&A: A Database with a Smart Interface.' PC Magazine, Volume 5 Number 5, for a full description of Q&A: features.

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that you didn't share here, wait a few more weeks. PC Magazine Labs will be reviewing a wide range of the latest database managers. We'll look into the mast important products and let you knaw their strengths and weaknesses.

### EXPANDING WHEN THE EXPANSION SLOTS ARE ALL TAKEN

Jacob D. Lee Granada Hills, California

Sounds like you've outgrown your computer—a cammon camplaint. Before you spend any mare maney upgrading your system, it would be wise to stop and consider your needs beyond it he near future and issue the next present of the future, you probably wantle have experient on internal mothan the state of the future, you probably wantle have experient on the state of the your's. Pentrury is would have been more problem to beyon external modem that needed only one of the two ports you have. It might be mane cast-effective far you

to upgrade ta an IBM AT, XT, or compatible that affers the features you need. Did you buy your Sr. Partner far its

portability? Adding an external hard disk will take that away from yau. Maybe you ueed to have a hard-disk-equipped XT ar compatible as a base system, while yau use yaur Sr. Partner away fram home.

If you decide that a hard disk and a few expansion cards will satisfy you, an expansion chassis can give your Sr. Partner the antians you need. Everex (Mauntain View. CA 94043: (800) 821-0806) has three models that retail for \$499: the Slim Line (with two half-height and three full-size slats), the Full-Size (with room for a fullsize drive and expansion slots), and the Half-Size (with room for two half-height drives and expansion slots). PC Harizans (Santa Ana, CA 92705; (714) 953-5396; \$549) offers the PC-Xtra (with five full-size and ane three-quarter slot). Panasonic's model RD9655 expansion box comes with three slats (Secaucus, NJ 07094; (800) 742-8086; \$399.95).

Using ane of these chassis, you would move one of your cards from your compuer into the expansion unit ance it's hooked up; you'll then have room far a hard disk, a hard disk card, a Bernaulli Bax, or just about any other addition that requires a slot.

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CIRCLE 513 ON READER SERVICE CARD

### **300-Megabyte Hard Disks** Now in the Works for PCs

New internal drives will equal or exceed storage capacity of many

minicomputers.

BY WINN L. ROSCH

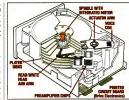
The next generation of internal PC hard disks will make today's 20- and 30-megabyte drives seem as tiny and slow as floppies. Internal drives are now available in 190-megabyte capacity; 310-megabyte (unformatted) disks are due in a matter of months. New peripheral interfaces are breaking the 5-MHz data-transfer-rate barrier, and higher-performance head actuators are cutting disk-access times-once a leisurely 100 milliseconds-to under 20, that is from 1/10 second to 1/10. IBM first made PC hard

disks available in March 1983,

with the \$4,995 PC-XT. Its 10megabyte hard disk had an 85to 100-millisecond access time and accounted for about \$2,000 of the cost. The PC AT advanced the standard to 20 megabytes and a 40-millisecond diskaccess time in August 1984; the disk cost \$1,595. In November 1985, IBM added a 30-megabyte PC AT option for \$1,995. If the IBM logo isn't crucial, 10- and 20-megabyte disks of various pedigrees are available today for under \$500; budget AT-speed 20- and 30-megabyte disks can be had for \$750. Maxtor Corp. of San Jose, Calif., produces the 190-megamatted) hard disk for several third-party suppliers. Core International of Boca Raton, Fla., is readving the 310-megabyte HC25 (about 250 megabytes formatted), which will sell for \$8.995

Fast Disks for Fast PCs The impetus for these funda-

mental changes in hard disk design lies in an increasing emphasis on high-performance desktop computing for network, multiuser, and data-intensive systems. Computer-Aided Design (CAD), engineering, scientific, and database applications require huge data-storage capacities and high speeds for access to that mass of data. (continued on next some)



Mussive hard disks that fit inside a PC help blar the line between the personal computer and minicomputer. The cutaway, above, shows a 190-negabyte Maxtor 5%-inch hard disk, with eight platters (PC hard disks have two platters). Core International plans to release a 310-megabste. \$8,995 anernal disk later this year.

### Laptops Gain Added Utility

New technologies improve screen displays and allow for hard disks.

BY CHARLES BERMANT AND CHRISTOPHER JOHNSTON

Rather than wait for IBM to set the market standard, competitors are refining the laptop/por-

table category themselves. The results fall midway between 5pound laptop notebook computers (Tandy Model 100) and 25pound fully-PC-compatible luggables (Compaq). Currently, Zenith, Quadram, Morrow, and GRID are among those adding new power to the in-between machines.

Quadram has announced a 20-megabyte drive in addition to two higher-contrast screen ontions: Morrow brought out a 10-mega-byte drive and screen

improvements; and GRID and Hewlett-Packard updated their screen displays. Most have 10inch diagonal screens with 25 by 80 displays.

(continued on next poer)



Zenah's Z-171 will be standard issue for IRS unditors working in the field, The IRS paid about \$1,444 each for the \$12Kbyte Morrow-designed machines.

### Hard Disks (continued from preceding page)

Moreover, the big, fast disks are pushing today's powerful personal computers into competition with minicomputers comments Hal Prewitt, president of Core International. "With the next generation of hard disks, you can put half a gigabyte [500 megabytes] into an AT and get all the performance you could only get before on a \$100,000 computer system,"

he says According to John Klonick of Maxtor Corp. three factors are working together to pack more megabytes into the 51/4inch hard disks that fit in PCs: more platters, new media, and high-per-formance head actuators.

### **Eight Platters**

Disk makers are stuffing more disk platters (the rotating elements upon which data are actually stored) into their drive units, adding area for storing data. Maxtor has squeezed eight platters inside a single 51/4-inch drive by putting the motor that spins them inside the spindle on which they are stacked. Even manufacturers relying on more traditional flat "pancake" motors now shoehorn seven platters into the same space. In comparison, the 10- and 20-megabyte disks of the XT and AT have two platters; the 30-megabyte AT has three.

New thin-film plated or sputtered metallic media allow data to be packed ever more tightly in the limited space available in the standard drive slot. Not only do thin-film platters hold more information, but also their tougher, pure-metal surfaces are less prone to head crashes and other physical damage.

As information is packed more tightly onto the platters. more precise mechanisms are required to access it. High-performance closed-servo voicecoil head actuators are replacing traditional band-stepper designs, a technology carried over from floory disks into the first generation of PC hard disks

Servo-voice coil actuators quicken track (and data) access as well as help boost capacity.

That's good because bigger disks mean more data to move around and a need to move it faster. Despite the new actuators, however, disk systems remain bound by the 5-MHz data-transfer rate imposed by the standard hard disk interface known as the ST506/412. Although 5 MHz

is too fast for PCs and XTs to handle disk data, ATs and RTs can manage it.

ESDI vs. SCSI Two new interfaces are preeminent in the next generation of hard disks: the Enhanced Small Device Interface (ESDI) and the Small Computer Systems Interface (or SCSI, pro-"scussy" nounced

'scuzzy''). ESDI allows data-transfer speeds beyond 20 MHz, although the first drives to use the interface operate around 10 MHz. The first pure ESDI systems designed for ATs, the HC series from Core International.

will be available soon. SCSI has already been adopted by Apple as the expansion outlet for the updated Macintosh computer. PC makers, too, are eyeing its high speed-it's designed to shift data at 12 MHz, more than twice as fast as the ST506. AST Research makes a \$7,499 74-megabyte SCSI drive, initially named the Colossus, now called the AST-4000

ESDI and SCSI operate at different levels in the system and can be used together, but, according to industry insiders, the combination is not favorable and leads to its own speed pen-This new generation in hard

disks just continues the same trend that has always been the theme in disk design-increasing capacity and performance. New big, fast drives are no fad, and the trend will continue, according to Sysgen Inc.'s Richard L. Newsome. "I don't think high-capacity drives will be a flash in the pan like HardCard-style drives." he notes, "People have an insatiable desire for more storage. If there is an empty space on your hard disk, you will

find a way to fill it."

### Laptops (continued from preceding page)

Zenith Gets IRS Award In late February, Zenith won

a \$27 million contract to provide 15,000 Z-171s to the Internal Revenue Service. The machines, which look like oversize lunchboxes with folddown keyboards, were designed by Morrow Designs, which produces the same machine as the Morrow Pivot. The Morrow/Zenith unit was

the hardware component of IRS bids by both Zenith and Sperry. (IBM's not-vet-announced laptop was another of the half-dozen final bidders.) The IRS-Zenith lease-nur-

chase contract calls for 15,000 to 18,000 Z-171s equipped with 512K bytes of RAM (upgradable to 640K), a 300/1,200 bitper-second internal modem, a graphics card, a 4-hour battery pack, and a carrying case. They'll cost the IRS \$1,444 each (\$40.12 per month for 36 months); the configuration lists for \$3,244.

The contract also includes external video displays, Epson thermal and Citizen letter-quality printers, software, and support. The software is Micro-



Destroyee 25 to available with a 20-megabete hard desk with a 3½-inch, 768K floppy drive.

soft's MS-DOS, BASIC, and Pascal: the Software Group's Enable (\$699) integrated package; Microrim's R:base 5000 (\$700) database; and Polytron's PolyWindows (\$49.95), Lotus Development's 1-2-3 or Symphony was conspicuously absent from the winner's circle: one source said copy protection and higher prices worked against Lotus.

#### **Ouadram Hard Disk** Quadram of Norcross. Ga..

recently added several options to its year-old Datavue 25 portable: a 20-megabyte hard disk and 31/2-inch floppy drives, a gravish-white fluorescent backlit screen, and a high-contrast

### ■ NEWS IN BRIEF

Intel Corp. of Santa Clara, Calif., has unveiled a 18-MHz 88287 coprocessor that does floating-point calculations at more than double the speed of older versions. PC AT owners can't benefit from the increase, however, without a daughterboard or other adaptation. Accelerator board and compatible manufacturers will find it of use in new versions of their products. For IBM owners, the 18-MHz 88287's future seems to lie next to the 88386 chip in future machines. Intel is shipping immediately in quantities of 188 for \$358.

Remember Visi On, announced around the same time as Microsoft Windows? It's back as the \$158 Control Data Corp. Visi On haplications manager, Version 2.8 providing as a conswhat kindoges like environment for other members of the Visi On femily (Chart, File, Plan, Mond, and Presentation). It also allow installation of other DOS programs and a link to CDC main frames. Visi On requires 512K bytes of RAM and a graphica monitor but esn't aupport color, the BGA card or multitasking, rendering its comparison to

amber-colored "gaslight" screen

Ouadram is also considering releasing the Datavue 25 with a detachable remote infrared keyboard that would be an under-3pound electronic notepad computer in itself, containing an 8-line, 80-character flip-up screen and memory. It would be available separately for under \$300 as the Keystyle 80.

With one 51/4-inch floppy drive and 256K bytes of RAM. the Datavue 25 sells for \$1,695 with the LCD screen, \$1,995 with the fluorescent screen, and \$2,145 with the gaslight screen. The version with dual 31/2-inch drives is \$100 more. The 256K Datavue 25 with a hard disk drive with a self-parking head and a 31/2-inch floppy costs \$3.495

The Morrow Pivot (a twin to the Zenith) has recently upgraded with a 10-megabyte hard drive and an improved screen. The price for a 320K-byte unit with a floppy drive and the hard disk is \$3,115. (Zenith said a hard disk version of the Z-171 is a distinct possibility.) Morrow says it weighs about 15 pounds. With two floppies, it's \$1,895. markedly cheaper than its Zenith twin

Morrow president Barry K.

Berghorn says 31/2-inch drives are a detriment to IBM compatibility. "Most people will use laptops to communicate." he says. "And it's very hard to upload and download from

those smaller drives Morrow's future is clouded, however, since the company announced that it filed for bankruptcy on March 10.

Improved GRID screen GRID of Mountain View

Calif., and Hewlett-Packard of Cupertino, Calif., each updated laptop machines shortly after the IRS bid was announced. GRID is now offering a vellow screen display with blue text characters on its 12-pound Gridcase 2 at \$3,150 with a 31/2-inch floppy and 512K bytes of

RAM GRID says the new LCD display roughly doubles the contrast from the previous Gridcase 2, to about 7 to 1, which GRID says is the best in the industry. GRID will continue with its \$4,350 Gridcase 3, which has a

HP's Portable PLUS is available with an improved LCD and increased memory/communications capabilities, the company says. The HP machine has no disk drives.

plasma screen.

## Hard Disk Cards Flood the Market

Winchester drives on expansion cards have become the fastestgrowing category of PC hardware: about a dozen products became available within the 6 months after the first one hit the

market. Costs are falling and capacities are rising, typically from 10 to 20 megabytes. Western Digital Corp. of Irvine, Calif., and Plus Development Corp. of Milpitas, Calif., cut prices of their 10-megabyte cards by \$200, to \$895 and \$995, respectively. By year's end, \$600

could be an average price. Mountain Computer of Scott's Valley, Calif., has introduced a 30-megabyte, 78-millisecond access-time version of its DriveCard for \$1,449. While the price seems stiff. Mountain contends the price-per-megabyte-\$48-is competitive with lower-capacity disks.

The More the Merrier

PC Mayazine has already examined many of the available products in "Hard Disk Cards: An Expensive Solution Worth Considering" (Volume 5 Number 6). Several others have been released since then.

Systems Peripherals Consultants of San Diego is offering its 22-megabyte Scorecard for \$895 The drive is detachable from the controller card and can be mounted anywhere in the machine. The Scorecard drive is not covered with plastic or metal, unlike other products.

CMS Inc. of Santa Ana. Calif., offers three hard-disk-

(Small Computer Systems Interface) version, a standard \$595 model, and an extra-rugged \$695 model, in which the heads never touch the drive when not in use. All are 20 megabytes. Each drive takes up a slot and a half.

No Motherboard Power Microscience of Mountain View, Calif., manufactures the 20-megabyte, \$1,095 Easy-Card, which requires that the disk drive power cable be rerouted. The card then draws no power from the motherboard. The card and drive can be sepa-

rated to facilitate repair. OnBoard, from Maynard Electronics in Casselberry, Fla., comes in \$975, 10-megabyte and \$1,195, 20-megabyte configurations. When placed in

the slot next to the PC's speaker, it takes up only one slot.

CompuAdd, an Austin, Tex., mail-order and retail firm, is selling the 20-megabyte FlashCard for \$595. While it does take a slot and a half, the company offers a half-slot floppy controller for \$20, freeing up another slot. Automatic installation software is also included. Express Systems, a Schaumberg. III., mail-order firm, has introduced the \$595, 20-mega-

byte Hard Disk Card, trademarking a name that some thought would become a generic characterization. Needing a slot and a half for operation, it is available with a 60-millisecond access time, a retractable head (\$50 extra), and software that allows it and any other installed hard disk to operate as one logi-



Mountain Computer's 30-megabrie DriveCard tops its speration in prace (\$1.449) and capacity—about \$48-per-megaliste

#### ■ CHRISTOPHER JOHNSTON

#### Microsoft Windows largely pointless.

Borland International has announced its Turbo Prolog compiler, which, the company says, is faster than other Prolog language
tools "by factors up to 18,888." The \$99.95
program will be used in developing microcomputer-based artificial intelligence tools. The Scotts Valley, Calif., company plans shipment by May.

Zenith Data Systems won a \$300 million Defense Department contract to supply 98,888 microcomputers over the next 3 years. Including the recent award to supply the IRS with Z-171 portables, Zenith has been the winner of four out of five major government Corp. won one competition for transportables The award for Zenith's 80286-based Z-248 system locks IBM PCs out of the Air Force and Navy and limits sales to the Army for the next 3 years. Prior to its 1983 contract: ontract for z-188s, which grew to nearly 48,888 machines, Zenith had no federal business.



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Curses as a labrary of eachiry-four functions and macros which can keep any number of screen images in memory. A screen may be full or partial size, and any can be summoned to the physical screen at your programs's command. The product ne product supports color, and all four memory models. In keeping with the rer-minal operation of Unix curses, the physical screen is re-painted (at high spee only when your program calls a refresh function. Within a screen, Curses employ a wast function set to get characters, wrap

ines, scroll, blank lines, highlight-virtu-ally any tool needed to update the screen

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nocal as defined is austere as an Alp. but Pro Pascal has sturdy outcroppings hang onto dynamic strings, random file record access, long integers, single and The TOOLSHED™ Trusted Favorites for a Well-Appointed Workbench CVUE Text Editor CVUE™ is Lattice's text editor which has undelete full path name support and fea-

Pro Pascal corrects such deviance to make your work acceptable in any cur-

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tains optimal index structures which will find a record amongst a million ten-byte sound, and, and .
They are 95% in C with those DOS and BIOS (used by many of the C functions) in Assembler Everything is sup-Ask for F0660 < plied as libraries and as documented source, so even for C savants, there's much to be learned rummaring about Demos show a sampling of what these pro-cedures can be combined to do, and the manual clearly presents and describes all

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standard to guarantee maximum portable ity anywhere in the C world. There are U nix users have always had "knf" to thoroughly clean programs before they disappear into a compiler

Pre-C<sup>M</sup> looms larger than "list" it finds
problems your compiler won'. Problems
that a debagoer will have trouble fouring
out Even problems which will cause trouthen plentful command line options to relax such ngor during early coding Use purchased binary libraries? Profile them for Pre-C and it will thereafter insure ble with other compilers.
Pre-C finds all the symactical trip that function calls from any C program are letter perfect. A miracle worker in speedthat will blow out a compiler and much subtler problems code which will never be accessed, casts with suspect conver-sions, variables declared as external but

never used, functions never called, machine-dependent expressions which inhibit portability, obsolete usage.

But the big service of "lim" is this: Compilers work with one module at a time. y know nothing of other modules

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Pre-C uses the Unix System III compiles.

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#### DAN BRICKLIN'S DEMO PROGRAM Slide Show Your Latest Great Idea

When the inventor of the electronic Create a screen-a snapshot of your planned product as it runs. Anything goes words, borders, box rules, inverse and spreadsheet called with a new pro gram, we sat straight up in our chair. Visi-Calc™ was for businessmen, but Dan's latest as for us programmers. idea into words? Programs are screens! Words don't work. The answer. Show your program as a procession of screens Dan's new program makes it easy It creates alide shows that impate a pro-

#### C-DEBUGGER

Source Level Pesticide S ymbolic debuggers at least let you refer to the names you give to variables, functions, etc. in your source pro-grams—so you don't have to debug C programs by way of hex memory addresses. By contrast, switch on the C Debugger™ source display, though, from the top or any breakpoint, and eracy the uncanny experience of watching your source code step by, one line at a time. Or skip ahead n lines and display from there. Or browse through source from the rounding program area—even from another file. Multiple breakpoints can be assigned to individual lines in your source files. Areas of memory can be set read-only to let a form of write protection find the most elu-sive bugs, like pointer encroachment. Trace options allow display of function. names and lines numbers as executed.

Backtrace writes a better of all functions

ed, a roadmap of how you got lost Other commands display and alter memory and registers, show and replace expression values. Simple variables may be referenced directly by name (Not local names which the compiler doesn't map) C-debugger supports four memo models and several compilers. (256k) Ask for \$1200 DC Bro

undertising of monochrome, foreground and background color on the CGA and EGA. Copy this "slade" forward with a key stroke, change it a little, to show the next instant of run-time. Copy the slide forward again. Create a whole slide show of your program in action. It will seem like the program itself is running

Each screen is in 80x25 character mode. not be mapped graphics. All 250 charac-ters and attributes are available from acrollable lasts which pop to the screen.
All commands are layered in Lotus style
pop-up menus, with frequent choices
mapped to the function losys as well. Screen areas can be blocked for out and paste or filled with color or charact ters, even made to blink. Slides of oft appearing segments can be made for eppearing sequences can be may have several overlaying and any slide may have several verlays assigned to it. Slides can proceed at time intervals or in response to keystrokes, and depend on a user's response, you can tell the program to branch anywhere in the slide sequence to create unumerable paths

through your show Don't make your ideas struggle through coding to get to the screen. Dan's Demo is able to prototype the program you are about to write, to position all the labels, keystroke inserface before it gets etched in code. It's blossomed throughout in code. If a bossomed transgrown
Lotus [wis] my major
test ste", says Bricklin
Each purchase of Dan's Demo entitles
you to redistratous fifty copies of the slade resector program along with your show. low because Dan thinks everyone should have one. You'll wish he'd penned Demo then and left VisiCalc for now (256k)

### dBC Lattice Library Maintains dBASE Compatible Files With the Power and Speed of C

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## Enhanced Printer Options Mark Epson and Panasonic

#### R FIRST LOOK

#### BY PHIL WISWELL

New dot matrix printers from Epson and Panasonic exemplify a trend afoot in printer design. These printers offer a variety of print enhancements that can be set directly from the front panel. a handy option when your software doesn't support the printer feature you need or you don't want to bother entering a batch of escare code

#### Epson Boosts Speed

The wide-carriage Epson FX-286 is a faster, more versatile version of Epson's popular FX-185, offering 136 columns at a claimed 200 characters per second in draft print mode, 40 cps in near-letter-quality mode. On PC Magazine Labs' printer benchmark tests, the FX-286 averaged 94 cps in draft and 30 in NLQ mode, making it 17 and 30 percent faster, respectively, than the FX-185. (The FX-185 was introduced in mid-1985 and lasted only 6 months before it was superseded by the FX-286.) The regular carriage, 160-cps



It is a part from the set, there you convolute show different type styles and roughly equivalent quality in the draft and neuroletter-quality modes of the Epson FX-286 (top) and the fuster Panasonic KX-P1595 wide-curriage neuers.



Epissis 3549 side-currange PX.256 rans at 94 pp in dryft mode. Depi in new-letterquality, cooperforming the FX.165 it replaced for ords 550 more. Claimed (80-cns actual) FX-85. P1595, which resembles the rest

continues unchanged.

The FX-286 has an 8K-byte buffer as standard (32K is optional), preventing it from tying up your computer during printing like so many printers with

smaller buffers do.

The printhead has nine pins that produce a 9 by 9 arrangement in draft mode and 18 by 18 in NLQ mode. The mechanism prints bidirectionally using logic seeking (undifferedional) in graphics mode). It comes with Roman, inlies, special international, NLQ, and both 1BM character sets. DIP switches also character between Epon italic and IBM Proprinter graphics characters. Tractor and fries characters rest. Tractor and fries characters rest.

tion feed are built-in, too. An

automatic sheet feeder is \$315.

The most attractive feature of the new printer is SelecType, a method for programming the FX-286 for ten different type styles by manipulating the on/ off line, form feed, and line feed buttons. It's a bit convoluted to learn, but once memorized gives you all the flexibility many software packages leave out, allowing you to select from the following modes and their combinations: condensed, double-width, elite, emphasized, italic, double-strike, underlined, super- and subscript, and perforation-skip (great for printing program listings with top and bostom margins).

Panasonic KX-P1595
Panasonic has produced another winner with its KX-

P1595, which resembles the rest of the Panasonic printer line in appearance and performance. It's a sturdy, sensible, easy-tooperate printer with more than its share of useful extras. Print speed is rated at 240 cps in draft mode, 51 cps for near-letter-

quality, in actual PC Labs testing, the KX-P1595 averaged 116 and 42 eps respectively. (With dot matrix printers, optimistic speed claims are the norm.) This nine-pin printer has three built-in fontis—draft, near-letter-quality, and boldface, proportionally spaced near-letter-quality—selectable

face, proportionally spaced near-keiter-quality —selectable from the font button on the front panel. These may be combined with the KX-P1595's five character pitches—10. 12. 15. and 17 characters per inch and proportional—chosen from another button on the front panel. A forms-length control lets you dail in 3- to 12-inch forms, remarkably simpler for nontech-

mental and a second control of the c

rd.
The unit emulates either Ep-

son or IBM Graphics printers and uses Diablo 630 codes.

#### KX-P1080: Few Frills

Panasonic also introduced its new KX-P1080 low-end printer, featuring a regular-width carriage and a 100-cps speed rating. In the PC Labs tests, the KX-P1080 averaged 77 cps in draft-print mode and 20 in near-

letter-quality mode.
It doesn't offer many frills, but a three-position front-panel switch selects draft, near-letter-quality, and 17 condensed-print modes through a switch on the front panel.

The KX-P1080 is of sturdy construction and offers a small footprint. At \$319 list, it's an affordable workhorse.



FX-286 Epson America, Inc. 23610 Telo Street Torrance, CA 90505 (213) 534-4234

List Price: \$749. Sheet feeder, \$315, 32K buffer, \$175. In Short: A wide-carriage sibling of the Epson FX-85, the 94cps (draft) FX-286 runs 17 to 30 percent faster than the shortlived FX-185 it replaced, for \$50 more. Understands both Epson and IBM Proprimer pro-

#### KX-P1595

KX-P1080
Panasonic Industrial Company.
Computer Products Division
One Panasonic Way
Secaucus, NJ 07094

(201) 348-7000 List Price; KX-P1595, \$949. KX-P1080, \$319. Bottom feed tractor, \$110; cut sheet feeder,

In Short: Easy-to-use from panel controls and superior speed make the U6-cps, wide-carriage KX-P1595 a good value. Understands Epson. IBM Graphics Printer, and Diablo 630 printer codes. The narrow-carvings. Track EV-P1000 Agrowthy competitor in the 5300

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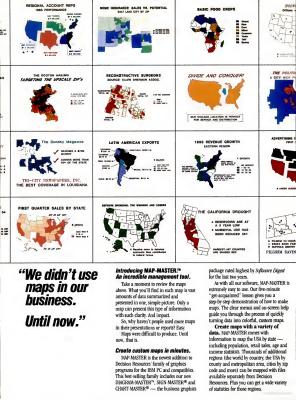


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## **CD-ROM Conference:Lured** By 600 Megabytes on Disk

#### R SHOW REPORT

BY CRAIG L. STARK SEATTLE, Wash .- With approximately 1,000 participants generating an enthusiasm not seen at recent Comdex shows. the First Microsoft CD-ROM Conference brought together publishers and programmers for 4 days to explore a medium that can store 600 megabytes on an optical disk less than 5 inches in

Like the now-familiar audio compact disks. CD read-only memory disks use a laser to write a pattern of tiny pits (approximately 0.3 microns in size) and spaces on the surface of a master disk. Proven massproduction techniques make it feasible to create large numbers of low-cost duplicates from each master disk. The ability to use existing audio CD production facilities, technology, and the same types of player mechanisms gives CD-ROMs the potential to open up access to massive databases that could appeal to a very broad market.

Grolier Encyclopædia Exemplifying the current

CD-ROM state of the art at the conference was the Grolier Electronic Encyclopædia. A single \$199 CD-ROM (\$995 with a Romulus CD-ROM drive, controller card, and cable for the PC) encompasses the entire 20-volume, 9-million-word encyclopedia and also contains flexible, full-text retrieval software from KnowledgeSet (formerly Activenture).

Besides giving the keynote address at the conference, KnowledgeSet president Gary Kildall also announced a joint venture with the Digital Audio Disc Corporation. Based in Terre Haute, Ind., DADC is a wholly owned subsidiary of Sony that currently presses audio CDs and will shortly press CD-ROMS. The combined venture will offer complete single-

site CD-ROM production facilities that include formatting, mastering, and replication.

The New Papyrus CD ROM: The New Papyrus (Microsoft Press, 1986, some 50 articles prepared especially for the conference, af-

cost only \$4,000. Since the disks are clearly \$34.95), a 620-page book with

suitable for use as unalterable. massive repositories of medical, legal, financial, or library catalog data, obvious CD-ROM applications include servicing specific vertical markets. Many of the conference speakers,

face was required) in Eindhoven

The ability to use existing audio CD technology gives CD-ROMs potential access to massive databases.

fords yet another illustration of what can currently be done with existing CD-ROM technology. In the space of 3 weeks-using only an IBM PC AT, the Blue Fish full-text retrieval software from Computer Access Corp., and the CD-Publisher system from VideoTools-the necessary 9-track production tape was prepared, sent to N.V. Philips in Eindhoven in the Netherlands, and a CD-ROM version of the book was produced. Mastering and pressing 50 disks

however, including Microsoft's Bill Gates and Borland International's Philippe Kahn, stressed a broader prospect. Apart from their use as computer peripherals. CD-ROMs offer an opportunity for developing low-cost "interactive readers" that will support sound and graphics as well as text. Such different applications as a demonstration 'Multi-Media Encyclopædia'' program from Microsoft, interactive game format programs, and navigational driving aids



potential of the disk to appeal to a wider public that would otherwise have little interest in computers. Developing the appropriate human interfaces for applications like these will necessarily draw upon the skills and experience of traditional "information providers" such as publishers, as well as the expertise of programmers.

Much Work to Be Done

If the conference opened vistas, it also pointed out the considerable work that remains to be done. An ad hoc consortium known as the High Sierra Group, chaired by John Einberger of Reference Technology and consisting of members drawn from all sectors of the ontical community, is completing work on a standard for logical formatting of CDs (the physical formatting has been standardized by Sony and Philips) to ensure their interchangeability

Only a week before the con-

ference, a joint announcement

by Philips and Sony of a preliminary CD-I (Compact Disk-Interactive) standard made some people think-mistakenly-that the regular CD-ROM might be rendered obsoletc before its introduction. Developing the software to retrieve information rapidly from a disk whose contents would take an entire week to transmit via a 1.200-bit-per-second modern is by no means simple, as Bill Zoellick of TMS Inc. in Stillwater, Okla., and numerous other vendor representatives pointed out. Nor is it easy to work out licensing requirements to protect the legitimate rights of authors and publishers when whole encyclopedia articles can be copied in an instant and run through a possible "auto-paraphraser"

But even if problems like these remain, the promise that CD-ROM offers clearly justifics their solution. As conference chairman Bill Gates noted. computer memory availability has tended to track memory requirements in an evolutionary way-relatively small increments at a time. CD-ROM represents a quantum jump in which quantitive change has clearly become qualitative.

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### **AutoMentor Builds Demos** And Interactive Tutorials

Nº FIRST LOOK

Training and education are only two of this program's uses.

#### BY FRANK J. DERFLER, JR.

Software Recording Corp. of America's new AutoMentor gives software developers the tools to easily construct standalone on screen lessons or a demonstration of almost any applications program.

AutoMeutor can be used to create illustrations, annota-

tions, or complete lessons. In software-related applications. AutoMentor can capture frozen screen pictures to be replayed in slide-show fashion. (In this respect, it's similar to Dau Bricklin's Demo Program (see page 54). With Bricklin. there is no link to other programs; you create screens from scratch.) Alternatively, Auto-Meutor takes control of an applications program and runs it while windows of explanatory text or questions are laid over the active screens. It could for instance, start 1-2-3, create a worksheet template, go to a range of cells, and then with a blinking box and arrow, indicate to the user, "Fill in firstquarter sales and profits here."

Both the screen-capture and program-running modes allow for interaction, on-screen comments and explanations, visual and auditory effects, and brunching based on certain conditions.

#### An Educational Tool In an educational or training

setting, AutoMeutor can create text screens with test questions and explanations in a traditional programmed learning model. The program's menu and branching capabilities let a course designer put together lessons with automatic reviews of weak areas, reinforcement of new concepts, and bypasses of mastered material.

As you create an AutoMentor lesson or demonstration, the program uses a videotape metaphor and illustration, VCR terms such as rewind, tape counter, play, and record make the operation of the program familiar and comfortable. This

tape format lets you step

can be called under a variety of

Menus, branching, and the availability of flexible and colorful windows make AutoMentor a good tool for building program explanations and illustrations. You can use the extended PC character set, including graphics characters, and an excellent palette display helps you quickly select background and foreground colors for windows and menus. You FACT

Software Recording Corp. of America 600 Fifth Ave., Fourth Floor San Rafael, CA 94901 (415) 258-0800 List Price: \$995. Developer's System with 100 run-time copies, \$2,995. Additional run time copies, \$8 to \$12 each.

Requires: 96K RAM, one disk In Short: RAM-resident program to create tutorials, demos, or lessons that run in conjunction with other programs or on their own. Copy protected.

Jeconi 1999 1985. Software Recooking Composition of Species

AutoMemor's menu, here overlaid at the bottom of a 1-2-3 worksheet, uses tupe or VCR metuphors such as "record." "plac." and "reveind" to describe its functions

through presentations and move the chain of screens and commands back and forth to insert. delete, or modify screens, win-

can paint portions of a frozen screen in color to highlight particular points. AutoMentor is memory resi-

AutoMentor is a formidable piece of software that should do a great deal to improve the tutorials and demonstrations available for other more mundane programs.

dows, and menus. At a menu or decision point, you can branch off to prestored "tapes" of the appropriate screens and text. The only limitation is disk capacity. A large tutorial can contain thousands of screens and dozens of different tapes that

dent and doesn't run with some other memory-resident software, including ProKey and SideKick. Nor does it work with programs that grab the screen or filter keyboard inputs like Velkswriter. With two popular graphics programs, ExecuVi-

sion and PCPG. I was unable to pass a Ctrl-Ins command needed to call AutoMentor, and so couldn't create graphic illustrations for a programmed text. I did, however, make a live running tutorial with the Crosstalk XVI communications package that worked well.

Voice Synthesis Soon Eleanor Dinovitz, marketing manager at Software Recording Corp. of America, says that versions of AutoMentor designed to work with graphics programs and to interface with the Texas Instruments voice-synthesis module are now in the beta testing stage; delivery is expected by midvear. Oral instructions can be digitized, stored to disk, and then played back later.

AutoMentor is not priced for a teacher's budget, although it would have a lot of value in school. A \$995 starter package allows you to record tapes and play them back, while a runtime version that allows you to make 100 running programs is \$2,995. Additional packages are \$8 to \$12 each. AutoMentor is a formidable

piece of software that should do a great deal to improve the tutorials and demonstrations available for other, more mundane programs. It's a natural for the corporate-training market as well as for educators with large budgets.

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## WordStar 2000 Picks Up Speed

#### **REFIRST LOOK**

BYBARBARA

KRASNOFF At the very least, you have to admire WardStar's staying power. The original was one of the first word processing programs for the microcomputer, and today users maintain such an intense love/hate relationship with it that a discussion between WardStar enthusiasts and detractors can come to resemble a verbal gang war.

One reason that WordStar is still so evident on the marketplace may be MicroPro's attention to the faults of its own product. Last year, in order to make its word processor more palatable to a wider user base. MicroPro introduced WordStar 2000 and WardStar 2000 Plus Now MicroPro has come out with an update of these two programs.

While the first version of WardStar 2000 retained such WordStar features as a Ctrl-key command structure and dropdown menus, MicroPro changed many of the elements that made the original WordStar so difficult for new users to learn. For example, the Ctrl-key commands are based on a more mnemonic system (which may be a hindrance if you're already "programmed" for the original WardStar command keys), the alternative command system using shifted and unshifted function keys and Alt-key combinations has been made easier to use, and the entire program has been generally overhauled to improve the user interface.

More Tortoise Than Hare The first WardStar 2000 had interesting new features. One was using style forms as overlays instead of formatting a file from within. For example,

overlaving a manuscript form on a file would automatically give you double-spaced, ragged-right text, while a business

letter form would be singlespaced and justified. (You can alter and save these forms.) MicroPro also included very slick mail-merge, spelling-checker, and key-assignment functions and, in WardStar 2000 Plus. threw in a communications program, mailing-list manager, and indexing program for good measure. Although the first version had all these assets, it had one major flaw: it ran like a reluctant tortoise. Just moving a

point B meant a wait of several very long seconds. This problem was so obvious that MicroPro quickly went to work on it. Release 2 was designed to speed up the program. and for the most part it does a good job. The scroll still tends to protest if you hold your finger down too long on the cursor key, but it gamely keeps going rather than stopping altogether. In fact, although Release 2 is no

block of text from point A to

speed demon, it certainly runs at quite a reasonable pace. The puckage comes with a daunting amount of paperwork: seven disks, a training guide, an installation guide, a reference guide, and a Plus guide that details the TelMerge, MailList, and StarIndex features. There are also several loose papers, such as a warning on how to install the new version for those who already have WardStar 2000. Release 1.0: offers for free DCA conversion and a RAM-resident version of the program; two command cards tone for WordStar 2000 and one for Plus), a keyboard overlay, and information about Micro-Pro's interesting telephone sup-

port service. MicroPro's usual telephone support is limited to approximately 6 hours daily. If you feel you need more individualized support, you can pay an annual fee of \$95 for membership in a premium service plan.

#### Document History

Release 2 also boasts several new features, which, although not necessary to the proper working of a word processor, are certainly very nice to have. One of the most interesting is a 'document history screen.' which appears by default whenever you begin a new document. This screen is meant to help you keep track of data about your file, including its title, author, the operator, distribution, key words used, and any other comments. It also automatically keeps track of the start date, the

date the file was last modified. and the keystroke count. Another nice addition is a two- or three-column formattine feature that is beloful in creating newsletters and such. Once you have chosen that par-



FACT WordStar 2000 2.0 WordStar 2000 Plus 2.0

MicroPro International Coro 33 San Pablo Ave. San Rafael, CA 94903 (415) 499-1200 (800) 227-5609 List Price: WordStar 2000. \$495. WordStar 2000 Plus (with TelMerge, MailList, Star-Index), \$595. Upgrade from Release 1.0, \$60; free if Release 1.0 bought after Nov. 1, 1985. Requires: 256K RAM for DOS 2.0 or 2.1.320K RAM for DOS

In Short: Release 2 proves a good deal faster than the original WordStor 2000 and 2000 Plus, with additional features of interest to the corporate market such as document history. Best used on a hard disk. Not copy

3.0. two disk drives.

ticular option, Release 2 will automatically wrap columns to fit on 81/2- by 11-inch paper.

MicroPro has added a memo form to its other style sheets that automatically supplies the format of a typical interoffice memo to your manuscript. It has also added automatic hanging and paragraph indents, tightened up a few of the already existing functions, and made several improvements in its telecommunications and indexing programs.

made a "RAM version" available to users who have PCs with at least 512K bytes of memory. By replacing two of the format overlays by one specially configured for high memory. MicroPro has enabled the program to operate in the way most RAMdisk programs do.

Finally, the company has

As it stands, Release 2 is an excellent, all-around corporate word processor that is sophisticated enough to handle a multitude of word processing needs. Although it might be a little daunting to a new user, anyone who has the patience to go through its thorough tutorial should have no trouble making full use of its capabilities.



above. Release 2 has speed improvements and features of interest to the corporate user.



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soft Windows-standard interface.

#### Micrografx "ORAW!" Runs on Windows

Last July, Micrografx Inc. introduced In\*A\*Vision, the first software product from an independent vendor to be written to the Microsoft Windows standard. Micrografx Windows "DRAW!" is the second Micrografx package to take advantage of this increasingly popular interface standard.

"DRAW!" can produce presentation graphics from 1-2-3 and Symphony spreadsheets and allows the user to manipulate drawing elements like text labels, titles, fonts, colors, line styles, and width patterns. "DRAW!" also allows freeform drawing, features a library of predefined images, and outputs to any Windows-compatible plotter or printer. Users must have Windows installed to run "DRAW!"

List Price: \$199. Micrografx Inc., 1820 Greenville Ave., Richardson, TX 75081: (800) 272-

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to hit a predetermined "hot lows you to swap data with it. completed chart or graph into

Box's compatible programs include 1-2-3, Multiplan, Word-Star. MultiMate. dBASE II and III. and R: Base 5000. List Price: \$97.60. New England

Software, Greenwich Office Park 3, Greenwich, CT 06830: (203) CIRCLE 630 ON READER SERVICE CARD

#### Data Sentinei Keeps Watch On Personal File Security Anyone who has tried to keen

sensitive data secret knows how hard it can be to thwart a determined pair of prying eyes. The Data Sentinel, from Rainbow Technologies Inc., provides a hardware solution to the data security dilemma. The Data Sentinel employs a

hardware "lock" that you install before plugging the printer cable in your PC's parallel port. Using the menu-driven software, the user then determines which files are to be protected and what method of encryption is to be used. No other user can access the secured files unless the corresponding key is insert-

#### ed into the lock

The Data Sentinel uses both the government's Data Encryption Standard (DES) and a Rainbow proprietary method. Rainbow offers three versions of the Data Sentinel: the Individual Key, which locks individual workstations within a Master system; the Master Key Set. which unlocks all computers within a system; and the Personal Key Set, which works on one computer only and has no corresponding master key.

List Price: Individual Key, \$200: Master Key Set. \$450: Personal Key Set, \$295. Rainbow Technologies Inc., 1797t Skypark Circle, Suite E., Irvine, CA 92714; (714) 261-0228 CIRCLE 629 ON READER SERVICE CARD

#### VOTAN VPC 2000 Speaks to **Voice Recognition Needs** The VPC 2000 Voice Card from

the Fremont, Calif.-based VO-TAN Corp. is a half-length voice-rec-ognition card for IBM PCs, XTs, and compatibles that accepts user-defined voice commands as if they were input from the keyboard. The VPC 2000 can remember up to 640 commands after an initial programming session where users tie oral commands to appropriate keystrokes.

The VPS 2000 can accept commands given over the telephone, and its digital recording and playback capabilities make it ideal for telephone message management. VOTAN says its markets will probably be telemarketing and data processing.

List Price: \$2450, VOTAN Corp., 4487 Technology Dr., Fremont, CA 94538; (415) 490-

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#### Emerald Technology Deals its Terminal Emulation/ Synchronous Modem Card

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#### HOT PROSPECT

#### Electrohome's ECM 1311 Color Monitor Automatically Adjusts to Graphics Cards phics Adapter, Enhanced

The Electrohome ECM 1311 is a color monitor that can handle any color/graphics card with a frequency range between 15.0 and 34.0 kHz. This includes popular models like IBM's Color/Gra-



Cir Efect when a PCM PULL votor monator (\$1,195) automatically adjusts for most video adapters in cluding IBM's CGA, EGA, PGC

Graphics Adapter, and Professional Graphics Controller. The monitor produces up to 720- by 540-pixel resolution. While similar to the NEC JC-1401P3A Multisync monitor, the Electrohome 1311 scans in vertical as well as horizontal modes. The ECM 1311 features long-persistence phosphor and a 0.31-millimeter dot pitch and connects to the PC through a standard BNC monitor cable.

List Price: \$1,195 Electrohome Ltd., 809 Wellingson St., Kitchener. Omeriu, Canada N2G 436; (519) 744-7111 CIRCLE 602 ON READER SERVICE CARD

#### New on the Market

(continued from preceding page) length expansion card. It also features compatible autodialer

software Jointly developed by Software Systems Inc. and Universal Data Systems and marketed by Emerald Technology Group Inc., the PC/5251 MATE enables the PC to communicate with IBM's Systems 34/36/38 family of minicomputers. It also enables 2,400-bit-per-second, 210C-compatible dial-un operations. A 4,800-bps option is also available. Hitting Alt-Esc toggles users between 5251 mode and DOS, making it possible to transfer files between

the two modes. The PC/5251 MATE's autodialer software supports automated sign-on and unattended operation.

List Price: 2,400 bps, \$1,395; 4,800 bos, \$1,995. Emerald Technology Group Inc., 1601 116th NE, #102, Bellevue, WA 98004: (206) 462-8200. CIRCLE 626 ON READER SERVICE CARD

#### Key Tronic's KB 3270/PC Brings 122-Key Layout to Microcomputer Keyboard

Micro-to-mainframe users tired of trying to jam the IBM 3270 keyboard's 122 keys worth of functionality into the PC's and XT's 83-key (and the AT's 84key) layouts might consider this new keyboard from Key Tronic

The KB 3270/PC features the 122 keys of a 3270 terminal, including 24 function keys, and is plug-compatible with the IBM PC, XT, and AT. It works with most popular 3270 emulation packages now available on the market, including IRMA, CXI, ATTACHMATE, and FORTE.

List Price: \$326. Key Tronic Corp., P.O. Box 14687, Spokane, WA 99214; (509) 928-8000.

#### Prime Computer Terminal is Now XT-Compatible

Prime Computer Inc., a big mover in the minicomputer market, has released a series of IBM-compatible hardware upgrades that will turn the company's T-200 terminals into XTcompatibles running MS-DOS 2.11, while still functioning as minicomputer workstations. Users will be able to have and use both configurations at the same time, toggling between minicomputer and various DOS

applications software. The upgrade kit includes a systems unit, a box with the option slots, and five IBM-compatible ontion slots, two of which are available for peripheral hardware. The kit is available only as an upgrade or re-

placement for Prime terminals. List Price: Floppy-based XT only, \$2,290; with 10-Mbyte hard disk, \$3,690; terminal and XT ootion together, \$4,300. Prime Computer Inc., Prime Park, Natick . MA 01760: (617) 655-

#### CIRCLE 625 ON READER SERVICE CARD Hewlett-Packard's Laserjet 500 PLUS Printer Adds Expanded Paper Handling

Hewlett-Packard Co. has added a new printer with more powerful paper-handling capabilities to its 8-page-per-minute Laserjet series of laser printers.



The HP Laseriet 500 PLUS (\$4,995) adds advanced paper-handling capabilities to

the Lazerjet line of luxer printers. The Laseriet 500 PLUS sunports two 250-sheet paper bins and a 250-sheet output bin, instead of the single 100-sheet input and 20-sheet output bins of the \$2,995 Laseriet and the \$3,995 Laseriet PLUS. It allows users to select among the two input bins either from the printer's front panel or from the PC's keyboard. The new printer delivers pages face down eliminating reordering, and separates different print jobs in the output bin. The Hewlett-Packard Lascrjet 500 PLUS is compatible with both parallel and serial interfaces and is fully software-compatible with earlier Laseriet models.

List Price: \$4,995. Hewlett-Packard Co. 3000 Hanover St. Palo Alto, CA 94304, Check local phone book for local Hewlett-Packard sales offices

#### CIRCLE 624 ON READER SERVICE CARD Tecmar's 640 Plus Memory Board Uses Lotus/Intel/ Microsoft Specifications

Tecmar Inc., introduced an extended memory card that adds up to 2 mcgabytes of Lotus/Intel/ Microsoft-approved extended memory specifications above and beyond the standard PC 640K-byte limit.

The 640 Plus card comes in four configurations, ranging from 256K to the full 2 megabytes. Users also have the option of buying the minimum configuration and filling the 640 Plus out with readily available

RAM chips. In addition, up to four fully populated boards can be installed in a PC to add a maximum of 8 megabytes of RAM

List Price: 256K, \$475; 2 Mbytes. \$1,396. Tecmar Inc., 6225 Cochran Rd., Solon, OH 44139-

3377: (216) 349-0600. CIRCLE 623 ON READER SERVICE CARD

#### **Guadram Accelerator Card** Exceeds AT Speed on PCs

Quadram Inc., the Norcross, Ga -- based peripherals giant. has introduced an 8086-based PC accelerator card that mimics the capabilities of an Intel

80286 processor. The SuperSprint card uses a switchable 8- or I0-MHz Intel 8086 central processing unit to effect a speed boost of up to 60 percent faster than the AT's rated clock speed of 6 MHz. It further increases valuable computing speed by holding the last 32K bytes of program code used, as well as an image of the first 96K RAM, in two separate caches on the board. The Ouadram SuperSprint card is fully compatible with all leading software packages and extended memory boards. It includes built-in support for an optional 8- or 10-MHz 8087 math coprocessor.

List Price: \$695. Quadram Inc.. One Ouad Way, Norcross, GA 30093; (404) 923-6666 CIRCLE 622 ON READER SERVICE CARD



8000

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#### ■ PC UPDATE ■ VIRGINIA DUDEK

Paradox. Version 1.1, from Ansa Software adds an applications generator and automatic multiple-file data entry capabilities and removes copy protection from this relational database, which was introduced last September. The upgrade is free to registered users; \$19.95 to others. Company president Steve Dow said the removal of copy protection was a result of user feedback. Contact Ansa at 1301 Shoreway Rd., Belmont, CA 94002; (415) 940-2030.

In the wake of the introduction of its downsized Compaq Potable II, Compaq Computer Corp. of Houston, Tex., reduced prices of its 8088-based portables, by \$500 on the Compaq Portable with dual disks to \$2,199 and by \$800 on the Compaq Portable Plus with 10-megabyte hard disk to \$3,199. Prices for Compaq's 8086and 80286-based desktop and portable units remain unc

Ashton-Tate of Torrance, Calif., has released Version 3.60 of MultiMate Advantage Professional Word Processor, Festures include columnar operations, a 40,000-word thesaurus, a typewriter mode, line and box drawing capabilities, automatic footnoting, forms generation and fill-in, and table-of-contents generation. Through April 30. Version 3.60 will be bundled with GraphLink, a graphics and text integrator, and MultiMate On-File, a file-management system. Upgrades are \$60.

MicroPro International of San Rafael, Calif., has announced LAN installation kits and corporate licensing agreements for Word-Star. IBM's PC Network, Novell's Netware, and 3COM's Ethernet are now supported by WordStar. Suggested licensing fees for WordStar are \$160 per workstation for three to nine workstations and \$140 each for ten or more after the purchase of one WardStar package at \$350. Licensing fees for WardStar Professional are \$225 and \$195, respectively, after the purchase of WordStar Profestional at \$495. LAN installation kits and licensing agreements are available from MicroPro dealers.

Lotus Development Corp. of Cambridge, Mass., says it is investigating incompatibility and technical problems found between Versions IA and 2.0 of 1-2-3, according to Alexis Driscoll, associate product manager for 1-2-3. "The problems labeled 'incompatibility' are not from software bugs but are the result of adding new functions to the program," says Driscoll, Reported problems include: Version IA treats labels as zeros when referenced in formulas, and the new release returns an error message; difficulties with the program that makes Version 2.0 files compatible with Version 1A; dif-ferences in the worksheet "wrap around" function. Lotus declined to discuss plans for a patch disk or another version of 1-2-3.

Kaypro Corp. of Solana Beach, Calif., has released a hard disk version of the Kaypro PC, an IBM PC-XT-compatible. The \$1,895 Kaypro has a 20-megabyte internal hard drive, a doubledensity 360K-byte disk drive, 256K internal memory (expandable to 768K), and an AT-compatible keyboard.

Short Takes: Analytics International Inc., of Arlington, Mass has upgraded ManoGrafx, a chart-preparing program. Version 2.2 contains Replay!, a built-in keyboard macro processor. Call Analytics for upgrades....Ferox Microsystems of Arlington, Va., has cut the price of ENCORE!, a financial-modeling program, from \$895 to \$475....Index Technology Corp. (InTech) of Cambridge, Mass., announces Version 1.6 of Excelerator, a systems analysis and design package. Enhancements include expanded analysis and graphics functionality, and new options for text input. Version 1.6 is free to customers covered by warranty or the maintenance plan and is available to other customers for \$500 ... Ashton-Tate of Culver City, Calif., has released the dBASE III Plus LAN Pack, enabling four users to share dBASE III Plus on a local area network. Now, more than one person can access a file without corrupting data. Programs and files done on dBASE III can be converted to dBASE III Plus. The LAN Pack sells for \$995.... Digital Communications Associates of Alpharetta, Ga., has cut \$100 from the price of Smart Alec, a micro to IBM System 34, 36, or 38 communications link product that allows PCs to emulate an IBM 5251 Model 11, 5291, or 5292 Model 1 terminal. Smart Alec now sells for \$895....Office Solutions of Madison, Wis., has released Version 4.0 of OfficeWriter. Registered users will receive an upgrade kit Upgrades are \$55 for current owners; \$170 for others

PC Update reports an saftware and hardware enhancements. To contribute, write or call PC Magazine, One Park Avenue, New Yark, NY 10016: (212) 503-5255.

#### Bricklin's Demo Program **Breaks Original Ground**

#### M FIRST LOOK

BY RICHARD AARONS Dan Bricklin's Demo Program is a winner right out of the starting gate. This remarkable piece of C and assembly language code is a wholly new concept in programming development.

Dema allows you to create. edit, and view a series of screens or "slides." Fach slide can be an image of what a running program looks like, created from any of the 250 displayable ASCII text and graphics characters. (Bit-mapped graphics aren't supported.) Text can be in normal, underlined, blinking, or color mode.

Bricklin makes excellent, intuitive use of the IBM keyboard and function keys to enable you to draw slides (screens) concisely and rapidly. Corrections are made by overstriking characters. Dema has its own learnmode macro facility to help with repetitive operations.

On-Line Creations After individual slides are

eether in a slide show that simulates the speed and smoothness of the real program. Transition from screen to screen can be timed or dependent on a response from the keyboard. You can even program in a simulated

disk drive access. Dema's documentation comprises 29 single-spaced pages of concise but understandable nononsense text plus an on-line demonstration obviously pro-

duced by the program. Dema is much like the world's first spreadsheet. Until the spreadsheet was invented. people didn't know how much they really needed one. Now they can't imagine life without them. After you use Dema once, you'll wonder how you



Dan Bricklin's mo Program Software Garden Inc. P.O. Box 238 West Newton, MA 02165 (617) 965-6988 List Price: \$74.95

Requires: 256K RAM, DOS 2.0 or later In Short: A multipurpose simu-

lation program that designs and strings together screens of all types for presentations, tutorials, and program prototyping. A remarkable new tool. Not copy protected.





## Why the Hercules Color Card is better for your XT than IBM's.

Did you know that there's a color graphics card specially designed for the XT"? It's called the Hercules" Color Card. We think that it's better for your XT than the IBM\*Color Graphics Adapter. Here's why.

The XT comes with an empty short slot. IBM's card is too long to fit in it, so you're forced to sacrifice a valuable long slot, while your XT's short slot goes unused.

The Hercules Color Card is designed to fit in this short slot. It's the smartest way to maximize the usable slots in an XT and provide for your future expansion needs.



Notice how much more efficiently Hercules makes use of the XT's slots.

Our efficient use of an XT's slots is not the only reason to buy a Hercules Color Card instead of IBM's. We give you a parallel printer port at no extra cost. (IBM charges extra and takes up another slot.)

À lot of people wonder how Hercules can do everything that IBM can in a card less than half the size. We do it by designing our own graphics microchips. Just one of our chips packs the punch of dozens of IBM's, reducing by more than 50% the number of components that can fail. And we'll do just about anything to make our products the most reliable you can buy.



ules IBM

Of course, you will have to give up something when you buy a Hercules Color Card. You'll have to give up software incompatibility. With Hercules, there is none. Every program that runs on the IBM color card will run on the Hercules Color Card.

You'll have to give up IBM's ninety day warranty. Ours is two years.



And you'll have to give up a dollar. The Hercules Color Card is \$245—IBM's is \$244. Look into the Hercules Color Card

for the XT, PC or AT. Find out why the readers of PC World voted the Hercules Color Card 1985's best color graphics card—ahead of IBM's. Call 1800 532-0600 Ext.420 for the name of the dealer nearest you and we'll rush you our free info kit.

## Hercules. We're strong on graphics.

BY CHRISTINA DYAR Itatin may not make sense to you, but it does to Productivity Plus (PRD+), a shorthand program for PCs. PRD+ converts abbreviations into full words or phrases. Itatin translates into

'it has come to my attention." Working in conjunction with word processors, spreadsheets. database managers, and graphics programs, PRD+ does its work without much effort.

The software cross-checks input against predefined word lists, and, as you enter abbreviations, punctuation, returns, or spaces, PRD+ enters the corresponding words.

Shortcut to Shorthand Abbreviations can be any combination of characters you phrase. The program comes with calendar and state abbreviations, 200 commonly mis-

spelled words, and 100 frequently used words of four characters or longer, such as kw for "know," evr for "every," and shd for "should." The standard list also contains salutations, closings, and

common business expressions: acon for "according to our conversation of," uasap for "I will let you know as soon as possible," and ifqs for "if you have

any question. You can customize the standard list and create new word lists with your own abbreviations. Each abbreviation can stand for up to 240 characters of

A keyboard enhancer such as ProKey or SmartKey could turn a single Ctrl- or Alt-key combination into several hundred (or thousand) keystrokes, but they'd be limited to only a few dozen phrases and wouldn't insert text as fast.

#### The Chemist's Friend

With PRD+, mathematical formulas and DOS command sequences can be abbreviated So can spreadsheet macros. A chemist, for instance, could enter ccl instead of carbon tetrachloride. You can also import data from another software program to a PRD+ word list. Lists can be merged or deleted to produce one list of up to 40,000

characters. The memory-resident package is guaranteed compatible with ChartMaster, dBASE III, Enable, Framework, 1-2-3, PFS:WRITE, Volkswriter Deluxe, Word Perfect, WordStar, and 13 other popular software packages: it can be customized to run with just about any software that doesn't take command

of your keyboard. Templates for the medical (MED+), insurance (INS+), brokerage (BRK+), and legal

(LGL+) professions will be available soon. So will a Stenoscript word list for those familiar with Stenoscript ABC Shorthand.



Productivity Plus (PRD+) Productivity Software

1220 Broadway New York, NY 10001 (212) 967-8666 (800) 654-8000

List Price: \$195; medical, insurance, brokerage, legal, Stenoscript ABC Shorthand tem-

plates, \$95 each Requires: 64K RAM, DOS 2.0

In Short: A fast, memory-resident shorthand program that turns abbreviations into words or phrases. Works with databases and spreadsheets as well as word processing programs. Not copy protected.



Debbie Does DOS To get its name in front of the public, Sperry Corp., best known for the kind of mainframes that run airline reservations systems, is aggressively seeking to have its equipment used in Hollywood movies. According to Sperry executive John Wise, new flicks starring Whoopi Goldberg and Kirk

Douglas will spotlight Sperry

Recently, however, Sperry was forced to hire a full-time employee to read scripts for suitability. Another computer

company was recently asked to loan a studio a computer system to put in front of the camera. Unfortunately, the movie turned out to be X-rated. The company? Wang.

#### At 40¢ a Sneeze, Who Can Afford To Get Sick?

sheet.

Artificial Intelligent is a fancy name for facial tix sue that neurly 40 cents o

In the search for new products to titillate its readers, mail-order house JS&A Products hit on Mighty Soft: facial tissues in a software-style ring binder and box. The price? A mere \$19 for 50 sheets.

"I think the idea is stupid, the price outrageous," wrote JS&A president Joseph Silverman in the catalog (1 JS&A Plaza, Northbrook, IL 60062), 'but since everybody is buying it. I won't voice my opinion too loudly."

Later, Silverman admitted, "It didn't break sales records The company sold one box.

#### Lessee. Howabout "Open Sesame"?

A long-running feud between a Washington, D.C., controller's office financial analyst, Alvin Frost, and city fathers erupted when someone broke into Frost's PC and printed copies of a memo critical of mayor Marion Barry. (Barry once called

Frost an "imbecile:" Frost had

warned against a shaky munici-

nal investment in a firm that went bankrupt.) Frost then changed the password to his computer, which also held city financial records.

Frost, who gained his independence from the city by quitting before he was fired, dropped a few hints for the city's computer wizards and consultants struggling to crack the password: Two syllables. seven letters, and the first syllable appears four times in the Declaration of Independence. The password itself doesn't appear, but it's what the Declaration is all about.



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STB's EGA PU 5" is a universal video board that operates in 16 different text and graphics modes, and is compatible with the IBM Enhanced Graphics Adapter". STB's EGA PUN" also provides 256K memory without need for the IBM Graphics Memory Expansion Card ... saving you money!

STANDARD FEATURES	EGA PLUS"	1BM *
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Supports full 16 colors in 640 × 200 and 320 × 200 for the IBM Color Display	~	~
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Supports a light pen interface	~	~
Includes PC Accelerator", ST8's exclusive utility program which provides up to 10 dak emulations, 3 print spoolers and utilizes available system memory, PC Alf memory slower one megabyte and EMS memory [Liutus" Intel® "Microsoft"] through ST8's Memory Compunion PC" board.	~	
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#### New features

Now all in one package you have the capability to create and customize graphs for presentation, analysis and planning. Here's just a few examples.







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Chart-It

#### Easy Interfaces

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SEFING IS BELIEVING

## THE PRODUCT INTRO DILEMMA



Introducing a new product is a perilous act. Should you preannounce it or keep it a secret until it's ready to ship? Either course can be dangerous, but ultimately, secrecy is better.

The computer industry has never really gotten its act together on how to introduce new products. Either they are preannounced, or there is strict secrecy right up to the unveiling.

Preannouncement would seem to be the more straightforward way of introducing products. After all, it doesn't involve the perils implied by secrecy. Preannouncements, however, produce widely differing results. There are four basic reactions to preannouncement of a product: derision, curiosity, paralysis, and calamity.

Manufacturers mostly encounter derivation when their claims are wholly incapable of being substantiated. The sales projections for the late Gavisin portation on one example. Altar's projections (5 mililion mechines in 1986) for the 520 for 320 area another. Someday medical science will recognize antalady, known as Returns between vestmentus Dementia. The layman, howvert, will always know it as Spreadsheet Fever.
When you're trying to figure out how

tall you're going to sit in the wallet after a new product introduction, the easiest figure to fool around with is projected sales. You may convince yourself, but unless your numbers are very conservative, you'll get hoots from everyone else.

A HEALTHY REACTION Curiosity is the normal, healthy reaction the manufacturer prays for when it preannounces a product. It hopes that enough early interest will build demand in the distribution channels, giving the product an easy birth. Too much curiosity, however, can raise expec-

tations over what the product can deliver. Users then become disappointed and reject the product for not fulfilling promises that in ever made. Paralysis is what the manufacturers both hope for and dread. They want their new offering to be so attractive that it hurts sales of their competitors! products. At the same time, they don't want to endanger the sales of their current offerings.

Calamity is the most dreaded effect of all. Some time between announcement and delivery date, something goes terribly wrong. The disaster comes from varied sources: The programmers he about how much progress they are making. The second round of venture capital never material territorial control of the condition of the market just evaporates. A couple of COMDEXES ago, the Business Solutions (Jack2) booth stood cheek by jowl with Ovation's. Both promised smooth, nearly transparent inte-



gration. The folks at Business Solutions were pleated because their demo work, but their video show didn't. At Osution, the does was great, but the demo wasn't ready. Calamity eventually beful both of them. Osution never made it to market be UCSD P-System instead of PC-DOS. Consumers rejected just about everything that didn't run under DOS (with the quirky exception of Dollars and Sense).

RUMORS IN THE WTOD Secrecy is fraught with its own perils. First off, there's almost no such thing. The rumor column in our sister publication, PC Week, has proven that people will sell their companies down the river for a T-shirt. Heads of companies, faced with this reality, go to extreme lengths. They establish off-side development and testing facilities. They beat-test in foreign countries. They dissuits products

For instance, Compaq insiders carried the new Portable II around inside hollowed-out older Compaq computers. Their secret was safe until they circulated the machine to some of the big software houses. As big as Compaq is, it still felt obligated to get the "blessing" of the key software players and its major customers. Well, the story pot out.

At what cost? Compaq hadn't finished notifying its dealers. It hadn't announced pricing, and it hadn't begun its advertising campaign. Since the machine is positioned not to compete against Compaq's existing product line, it wanted the chance to explain the machine to its dealers and the

## W . . .

## WHAT THE HECK!

## ProDesign II The Easy to Use CAD System!

ProDesign II is one of the most advanced CAD packages available for microcomputers. We think it's absolutely the easiest to use. "With competitive CAD systems priced at \$1500 to \$2500, we were

posed with the problem of setting our price. Problesign II works with nearly any picture or printer available for derions. It works with nearly any picture or printer available for the IBM PC: Problem II on any protes picture quality drawingle on ordinary dr. makers printers - a feature found sensitively on the printer of the printer of the price of the price of the size of the physical access to make it practical to produce drawings on a normal resolution IBM monitor. Problesign II is twill an outstanding CAD package for the IBM PC and compatibles. The question we had to answer was: Even though we had a better product, should we prote in higher than the other CAD systems where the product a protein the protein that the other CAD systems are sufficient to the protein the protein that the other CAD systems where the product a protein the protein that the other CAD systems are product, a picture of the protein that the other CAD systems are product, a picture of the protein that the product a picture of the protein that the product should be the product and the protein that the protein that the product of the product should be the product that the protein that the product of the product that the product that the product of the product that the product that the product that the product that the product the product that the product that the product that the product the product the product the product that the product the product that the product that the product the product

We did market studies and calculations. We consulted with experts. We draw charts and graphs. We used the finest spreadsheet programs money could buy. When it came right down to it, we still didn't know what to sell ProDesign II for \$89967 \$24967 \$19969 We even considered \$996. Then, in the great American tradition, we said, "AW...WHAT

THE HEXE Let's see the other guys beat this price!" ProDesign
II costs \$299. At that price, you can't go wrong!

AW ... WHAT THE HECK!

#### #OOO OF

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Why should you get ProDesign II? Four simple reasons:

1. ProDesign II is easy to use. You won't have to spend

weeks learning simple functions.

2. ProDesign II works with the hardware YOU own.

ProDesign II supports most printers and plotters available for the IBM PC, as well as a wide variety of digitizers and mouse devices.

 ProDesign II can produce plotter quality output on ordinary dot matrix printers. (The B1 Bomber above was printed on an Epson RX-80.)

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#### ■ FROM THE EDITOR'S SCREEN

trade press. While it's fairly obvious that the Portable II will encroach most heavily on the standard Compaq and Compaq Plus, the company's intent was to let the market seek its own level. The sooner the story gets out, the greater the chances for prejudgment.

Microsoft went through a different version of the same trauma at its recent Microsoft Windows Developers Seminar. Over 400 prospective developers of Windowsbased products were on hand to learn why they should invest the time and effort of developing their next product under Win-

The bottom line with Windows is that it is a precursor to flutus versions of DOS, especially in areas having to do with device drivers, memory management, and multitasking. Vice president Steve Ballmer walked the hairy line between telling the developers about future DOS features and actually making a product announcement.

COMPANY SECRETS Why, you may ask, the secrecy? Doesn't Microsoft have a hammerlock on DOS? Yes and no, as it turns out.

Microsoft has such close ics with IBM at it must be exceedingly careful about what it says. Anything that could be used to driven future IBM plans and products would be frowned upon. Also, Microsoft is not the only game in town. Many of the techniques embedded in Windows and future versions of DOS could be siphoned off by operating environment enhancers and even applications programs. Not only would fine blant his blant the impact of the product is sufficient to the country of the product in would fine the energy from the import of applications to run in protected mode on 8026 and 80308 forcessors.

Which gets us back to the central issuesecrecy. You can find more snow blowers in San Diego than true innovations in the personal computer business. Most of the original ideas can be knocked off by upstart competitions in a matter of weeks. The window of opportunity for any new product, therefore; is narrow. Every leak lessens the chance that the introduction will go the way the manufacturer plannufacturer plannufacturers.

Perhaps you've noticed that PC Magazine doesn't deal in preannouncements of

products. While we work extensively with manufacturers under nondisclosure agreements, nothing is real until the product is on the dealer's shelves. That way, you're assured that the evaluations you read re-

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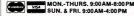
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- Jerry Grange: meet in Chicago on the 19th Osr30AM: Metch videotape of Annual Meeting 10:00AM: meeting with Bart Lewis + directions + agenda

+ 02:009M: staff meeting Thursday January 9 08:00AM: phone calls 11:30AM: lunch with Amy Wile

11:30AM: lunch with Amy Wile Word Processing and Spreadaheet work Etansfer to word processor: letter to Nom 1 abilt-chat

The kids are back in school
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documentation for spreadsheet: NOLLOUT MKS
calls F38, G38:
\* increased ad budget for new product rollout
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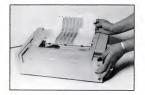


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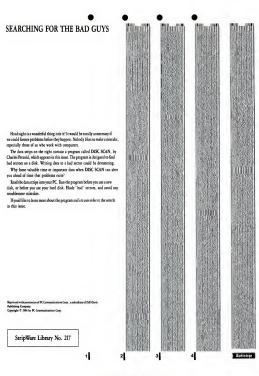
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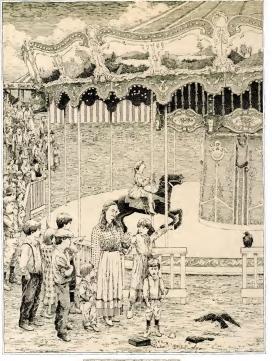
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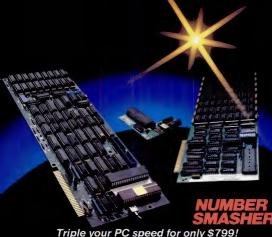
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CIRCLE 537 ON READER SERVICE CARD

# DOWN WITH THE PC AT, UP WITH THE COMPAQ 286



Originally an AT ally, Norton pooh-poohed AT hard disk crash rumors until his two ATs bit the dust. Now he recommends the Compaq 286, Model 4.

nee again I'm interrupting my ongoing discussion of disk mayhem to remark on this issue's main topic—those blankety-blank AT problems—and to empty my ever-full mailbag. Let's beein with the AT.

Let's regan with the AT.

When they first came out. I bought two
ATs, loved them, and have highly recommended the AT for serious computer users. I also pooh-poohed the reports of serious difficulties with the AT's hard disks. Although I never denied that AT owners had real troubles, I was skeptical about how widespread the problem was

Since then, one of my two ATs has eaten its factory hard disk and has started nibbling at the edges of a replacement 30megabyte disk. The other AT has eaten its original hard disk, two replacements, the disk controller, and its keyboard to boot.

I was rescued from this disaster by two unusual pieces of luck. First, for no good reason I'd bought a spare hard disk for my AT. Second, my original drive died gradually, giving me time to transfer my data. Most hard disk deaths aren't so forgiving, which is why I believe every system should have tape-backup capabilities.

I thought the rash of problems with my second AT might have been provoked by the electrical power supply in the office where I'm using it, because frequent brownouts occur. But in spite of the power deficiencies, the Compag 286 stilling next to the AT has no problems, which leads no to believe that the AT itself is as fault. By comparison, the 286 is a robust machine.

Frankly, I no longer see the AT as the professional's PC of choice. Contrast it with Compaq's top-of-the-line Deskpro 256. Model, 4 BM disapproves of putting fast crysals into AT's to speed them up of cand even prevents in with the AT's new dard. IBM makes 30-megabyte disks an extra-price option and forces you to sscrifice the fast-crystal option to get 30-megabytes (Compa makes 80 megabytes) and dard on the Model 4. IBM doesn't provide and the second of the second of the second population of the second of the second of the group makes an internal tape standard. And Compag gives you than infly dual-model display and a choice of green or amber

The Compage do have their drawbackethey don't have that great IBM keyboard, the internal tage in't as fast or capacious as others (such as the terrific Tecrnar and Maynard units), and the dual-mode display really isn't as good as, say, using a Hercules graphics card. But I've come to the conclusion—backed up by my own re-



liability experience—that the Deskpro 286, Model 4, is the personal computer of choice, particularly if you want off-theshelf excellence (rather than putting together a mix-and-match system). The proof of it is that I'm about to buy half a dozen AT-class machines for my office, and I've settled on the Compaq.

MY OVERFLOWING MAILBAG MY mailbag is full of notes from intelligent folks who caught my silly mistake in the boot record program that I contributed to the Programming/Utilities column (PC Magazine, Volume 5 Number 2), I'd wondered why my little nifty didn't work on some color-graphics PCs and similar machines. The reason was simple enough-I'd used register BX as a data pointer, even though I'd meant to use register SI (as my program comment stated); but, as IBM's documentation clearly states, some versions of the BIOS use BX to control color and display page. Sorry for my error, folks. Change all five BX references to SI and all will be well.

I've often commented on how many and disk men get prov performance out of their computers simply because DOS is using too few disk buffers. You can control the number of huffers with a BUFF.

EKS= statement in your start-up CON-FIG. SYS file (if you don't know what this all about, how up on it in your DOS is all about, how up on it in your DOS of buffers and often find 32 or 64 for even the 99 maximum) worthwhile. There's a cost, of course: every two buffers eath up 1 K byte of RAM, and too many buffers can

#### ■ PETER NORTON

actually slow down some computer operations. But, usually, the more the better. One reader, James Harrison, wrote in asking why DOS kept him waiting so long at

ports the amount of free space on the disk. The problem he encountered is actually a handy and crude way of determining if we have assigned too few buffers. Use it as a the end of the DIR command when it re- simple yardstick-if DIR keeps you wait-

ing, you can try upping the number of buffers you allow DOS.

THE DORAN TEST | got lots of flak about both the "Doran Test" and my comment here in my column (Volume 5 Number 2) that hard disk interleaving isn't something to mess with. Joe Doran, inventor of the Doran Test, and I have claimed from the beginning that it is a very crude benchmark of disk performance-but one that could be used in lieu of anything more sophisticated. Doran's test divides the disk's capacity (as reported by CHKDSK) by the time it takes to read the whole disk (using my DT-Disk Test program) to get a rough idea of the effective speed of the disk, including influences such as the DOS formatting and cluster size. It's not a lab standard test but it does give meaningful results, and the tools to perform it are already in the hands of most PC users. So you sophisticates stop throwing bricks at Doran's test.

Bricks are being accepted at the "don't mess with interleaving" department. The software that comes with many hard disks (and also some versions of IBM's advanced diagnostics) allows you to set the interleave factor on a hard disk, which can significantly influence the effective speed of disk operations. But you've got to be a serious tinkerer to do it. Changing the interleaving factor involves unloading the data from the disk, doing a hard reformat (changing the interleave) and then a "soft" (DOS) format of the disk, reloading your data, then testing to see if the disk operations that you do are faster or slower. I wouldn't dismiss the idea as a way of improving the performance of your PC, but it strikes me as being more for people who like to tinker than for serious PC users. Besides, the default formatting that comes with your disk should be generally optimal (unless somebody back there is not doing his homework)

But, you can change the interleaving of your hard disk-if you have the right kind of hard-disk-formatting program.

A NORTON BENCHMARK TEST 1've also been receiving some curious notes from folks who have been using my System Information program on ATs and some other machines as well and getting a



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#### ■ PETER NORTON

very odd result. The SI program includes a brief benchmark of raw computing speed, which it reports relative to a stock PC. A PC gets an index of 1.0, a PCjr about .7, an 8086-based Compaq Deskpro about .1,7, and a Compaq 286 or an AT sourced

up with a fast crystal about 7.7. Now my computing index can and will vary from report to report by up to about 15 percent simply because it uses the computer's clock to time how long SI's benchmark computation takes, and the computer's clock "ticks" only 18 times a second. That may seem often, but it's a crude measure of time for the purposes of SI's benchmark. If I make the computation take longer, I could avoid some of this problem, but that would make the process take longer than most folks would care to wait. SI's computing speed index was intended to be nothing more than a crude measure of the computer's speed. Besides, all computing benchmarks, including those much more refined than SI, have a lot of baloney in them concerning which kind of computa-

While SI is admittedly crude and slightly uneven in the index it reports, it was supposed to be sound. But reports started coming in that the latest version, 3.10, was consistently reporting a lower index on Deskensed mechanics, like the AT, than the previous version. For example, an AT or Deskepo 286 numling with the fast 8-MHz clock would get a comparing index of 17, which version 3.00 of the program, but an only a 10 percent difference—well within the index's margin of error, but it's a consistent difference for AT's that doesn't happen for regular Paper for Paper for regular Pa

tions they are measuring.

It took ingenuity by my team to figure it out. While the actual benchmark test hadn't changed, some slick new features had benn added to the other parts of the program. This displaced the locations of the data that the benchmark worked on. So what? we'd say, under normal circumsances. But 286-based computers like the AT feeth data from memory 2 bytes at a me. If a program, like SI, asks for 2 bytes of data from an even memory address, it me. If a program, like SI, asks for 2 bytes of data from an even memory address, it do not be supported to the state of the data data the even address, both byte swould be feethed in the same memory evel; at the

odd address, it would take two separate cy-

cles to put together both bytes.

By accident, data in Version 3.00 of the program fell mostly on even boundaries; in Version 3.10, on odd ones, which slowed

down the computing index. It could easily have been the reverse or no different. Now that we know about the problem, we'll make sure it's handled consistently—but how embarrassing!

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# THE MAGIC OF THE RT PC: LAVISH SPEED AND POWER



Exciting but expensive, the first RTs will most likely be used for engineering or such complex applications as currency trading.

BM's RT Personal Computer is a genuinely exciting new product. It's a marketing coup—the first useful, affordable, reduced instruction set computer (RISC) to make it to market.

It's a technical coup: packing all that speed and power into a desktop machine is very impressive.

And it's a positioning coup delivering so much machine for \$11,700 (make that about \$19,500 or so with a monitor, the RT PC's \$3,400 (buch!) AIX operating system, and an AT-compatibility additional and software must be awfully intimidating to other computer-makers such as the Welt-Packack, whose highly-touted "spectrum" series of RISC machines has been beaten to market despite HP President John Young's public commitment to a "RISC future" for the company.

The RT PC's a dazzling machine: 2plus MIPs (millions of instructions per second), a 23-MHz clock speed (though still just 6 MHz on that 80286 AT-compatibiity card), up to 3 megabytes of RAM in the desktop model and 4 megabytes in the floor model, more than a trillion bytes of virtual memory, support of the IBM EGA and PGA color standards, plus new highresolution color and monochrome moni-

I love the RT PC. I truly do. And yet, and yet....

We've got to remember that this is far from a mainstream machine. No one's going to spend four times the (street) price of a comparable PC AT (or five times the price of a good AT clone) to run those same old DOS applications programs. But so far, there's not much available for the RT PC under its native operating system—that pricey AIX UNIX System V

NOT MUCH OUT THERE At the RT PC's introduction in late January, IBM isletd a few packages that were due to be available by the time the RT was schould to start shipping at the end of March. In the general-basiness realm, there's Solacounting package available for personal computers, and there's SoMM-A+, a ho-hum word processor that desperately needs the RT PC's seed for the RT PC's se

And that's it. No spreadsheets, business graphics programs, mainline word processors, or anything else.

No fair, IBM says: "We didn't intend this as a general-business machine. That's the AT's job. The RT's made for the engineering/scientific/technical community.



And besides, anyone who wants to run general-business applications on the RT can buy the AT-compatibility board and software and run all those existing PC ap-

Sure—but how long do you think business-software developers are going to be able to resist 23 MHz, 3 megabytes of available memory, and a trillion bytes of virtual memory?

Which leads to some interesting speculation about what we may see running on the RT before too long.

FLOOD WARNINGS First, in its own realm, we'll see a flood of engineering and architectural design software ported over to the RT PC. IBM provides a C compiler in that AIX package, and anyone with a CAD package in C running on something else—especially under UNIX System 5 on something else—especially under UNIX System 5 on something else—is in good shape.

At Autoclesk, John Walker says they have Auto-CAO on the RT just as soon as they can get their hands on the machine and get to work. Since Auto-CAD is already in C and running on such UNIX-based migracing workstasions as the Sum Micro-systems machines. Walker's informal guess of 2 to 3 mentals for the port sounds good to be a superior with the sum of the sum of

Second, in the business applications universe, look first for high-function programs for managing money. I'm not talking about checkbook balancers for you and

#### JIM SEYMOUR

me, but vast, complex programs with substantial doses of artificial intelligence. They'll handle such things as tracking and matching forward positions in foreign-currency trading for multinationals, or assem-

bling multiple-location cashflow reports and updating cash models for corpora-

You can expect to be knocked over by the prices for some of these programs-

-say, \$25,000 and up-but the high-ticket work they're handling will make those prices seem like peanuts to the money managers who'll be buying them.

#### RECOUPING YOUR EXPENSES Just as you and I might gloat over paying for an

AT or a Laserjet with one big-hit use of the device, these people can easily recoup \$20,000 of hardware and \$50,000 of software in just one deal. And you can bet they will.

In a somewhat larger market, we'll certainly see programs to calculate route schedules for trucking operations. Figuring out which stops which drivers should

# How long can businesstrillion bytes of virtual

software developers resist 23 MHz, 3 megabytes of available memory, and a memory?

make, in what order, with which packages in which trucks is a phenomenally complex job-yet one with an immediate payoff for any firm operating more than a few trucks in any large city.

Existing programs calculate route sequences and print schedules for drivers. but the recalc speed and number of variables they handle is severely constrained by the performance limitations of AT-class computers

Put that job on an RT PC and stand

back That's the key, I think, to understanding how the RT PC will worm its way into business applications: look for applications that are presently constrained by speed, memory size, and storage limitations on ATs.

Then see if speeding up those applications and making them easier to use has a high payback for users. If the answer's yes, you can bet we'll see RT PC/AIX programs for that job. And soon.

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# GRAPHICS: HEADING OFF THE CHARTS



Manes runs into an old high-school chum who thinks business graphics aren't worth the paper they're printed on but is making a mint selling the software.

The last time, I ran into him at Bowcy and Grand, where he attempted to clean my windshield with the remaints of a wine-stained brown bag. Now my old high-school classmate. Dead head Gi. whose sales career has recomciously cages, was emerging from a lony canner with a Bodedon on his arm. a Rolex on his wrist, a Meladandri on his back, and a chalfureut Bettely on the street. Since I was coming out of a pizza joint, I pretended not to notice.

"Hey, Bigmouth!" he hollered.
I'd always been a sucker for my highschool nickname. "You win the lottery.
Ed?" I called as I crossed the street. Somehow I couldn't bring myself to use his high-school sobriquet in front of our leading daytime actress.

"Nope," he said magisterially as the soup siren nibbled on his car. "What did it was business graphics."

He handed me a card. His name was superimposed over a trend line with an upslope steeper than that of the north face of the Eiger.

"You know how it is in business, right?

Any little thing to give you the edge?"

Obviously I would not have been reduced to eating in that pizza establishment if I knew the slightest thing about business.

Or food. "Of course," I said.
"The competition was beating me silly.
Every time I got set to close, somebody'd
beat my time with a better presentation.
Then this computer and 16-pen plotter fell
off a truck."

"Or was pushed," I hinted.

BETTER THAN A TOASTER "Bigmouth," he said with a wink, "the computer is the greatest labor-saving device since the toaster. Me and the machine, we were the equal of any big company with a whole graphic arts department. The presentations I created! Pie charts, scatter charts, bar graphs, line graphs. In color yet!"

"And sales picked up?"
"Picked up? My sales trend line looked
like the launch of Voyager 2."

like the launch of Voyager 2."

Miss Procter and Gamble gave him a proud but silent kiss on the cheek.

"What I never realized was how graphics can unleash your creativity. Say you've got a slow-growing product, but you want to give it a boost. You enlarge the scale, show just the top, and the graph looks like Mount Ens."

"Creativity," I said.

"Right! Or you can put meaningless numbers on the sides of the graphs—or no



numbers at all. Look at some of the sales charts they print in computer magazines. Do the numbers mean some unit price, or some ratio of current price to some other price, or what? Who knows? Who cares? Look here!"

From the greenery in his overstuffed wallet, he dug out a frayed clipping from The New York Times Magazine. "This is about a meeting with the chief exec officer of Avon. H. D.S. means home direct selling. Read."

I read: "There is a bit more talk, then it's decided that the chart will be redrawn so that the H.D.S. segment will be shown getting bigger at a slow rate, so people won't think it's shrinking, even if it is. Reality and charts don't always coincide in business."

"In other words," I paraphrased,
"business graphics is a creative way of lyine."

"Lying? In business? Bite your rougue!" He waggled his golf-ball-sized emerald in my face reprovingly. "It's just a question of putting the best face on the situation. You got a problem, you hide it in one of those stacked bar graphs nobody can ever figure out. Or you invert the axis, so you get a nice rising curve when everyhing's actually sinking into quicks and."

"But if everybody does this," I asked, "how could it be so powerful for you?" "Because I stopped using it!"

#### MY MOST MEMORABLE GRAPHIC I shook my head in utter bewilderment.

"Big, there's a graphics war on. It's so casy to make the damned things, every-

#### ■ STEPHEN MANES

body's got 'em. Stop the next five guys | you see with sales cases: They'll all have thick books lined with chart after gorgeous chart. Or transparencies and overhead proiectors, or even portable computers that

run little animated shows."

"Pretty depressing," I admitted.

"And if that isn't bad enough, look inside any big company. People are spending one-third of their time making graphs,

one-third showing them, and the other third looking at other people's."

"You could make a pie chart out of that." I pointed out. "I already did. Now, you tell me.

When was the last time you saw an exciting graph-or even a memorable one?" I couldn't remember. "When was the last time you saw a

graph you trusted enough to accept without seeing the underlying data?" I thought there might have been a cou-

ple back in analytical geometry class. "And when was the fast time you made

a decision on the basis of a graph?" I had bought a tattersall shirt a couple of

"Well, there you go. Graphs lie. They The State of Parties and Market The Market

· "When was the last trusted enough to accept without seeing the

# time you saw a graph you underlying data?"

confuse. They bore. So I dumped 'em. I walk in with no presentation book, no computer, no projector, no nothing. I ask to talk to the right person; I say I won't waste our time with a single slide, chart, overlay, or presentation graphic. I tell them about the product, I make the sale, and I'm gone.

Ed followed his friend into the Bentley. "Everybody's happy. The eustomer's happy because he gets rid of me in a hurry. I'm happy because I get to make more calls, and I don't have to lose sleep producing all those charts or get musclebound earrying them around. Today, a word is worth a thousand pictures."

'Sounds like you've got it figured." I said with genuine admiration. "What are you selling nowadays, anyhow?"

"A boom product! A fantastic product!" the erstwhile Deadhead enthused as Jeeves revved up the motorcar. "The product of the eighties: business graphics software!"

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# THE MYTH OF STANDARDIZATION



The so-called DOS standard simplifies the work of hardware and software developers, but it leaves users struggling with a flood of complex, competing, and incompatible products.

ome 4 million or more IBM PCs, XTs, ATs, and compatibles have been sold in the past 4 years, according to most estimates. Forecasters believe that at least 2 million more will be sold this year alone. Most people point to this recredible success as evidence that DOS has become a standard in the personal computer industry.

The industry says that this standardization has enormous benefits for everybody involved. Consumers get virtually unlimitde choice in either features or price because companies can develop software, experimentally experiments, to the same specifications. And all customers, either corporation or individual, can design a system that suits their needs exactly in and resources to solving customers' ity and resources to solving customers' in the control of the control

Is this what's really happening, or is it just industry propaganda? Probably the later. What is really happening is mass confusion and rank disappointment for exactly the people who are supposed to benefit most from the standard: the average guy who uses a computer.

Say, for instance, that I want to build a DOS system for writing articles or doing financial analysis (which are the two primary applications of personal computers). That seems easy enough: I just buy a two-floppy-disk 256K-byte PC or compatible, a monochrome monitor, a display adapter, a printer, and the program that does what I aprinter, and the program that does what I

want. No problem. If I really want to get the right system, of course, I would have to evaluate more than 200 separate products and about 15 different technologies. But I'll probably just buy what everybody else is buying, and it will probably work.

#### MERELY TYPEWRITER REPLACE-MENTS But is having a computer system that can do one thing really the intrin-

MEATS But is having a computer system that can do one thing really the intrinsic value of a personal computer? Have so many people been getting excited about these machines because they replace our typewriters or calculators? Or is there something more that we should expect from these machines?

Say that I would also like to use my computer to organize to-do lists; maintain a contact list of names, phone numbers, and addresses; update a prospect list of a couple of thousand names and addresses; send and receive electronic mail and peruse remote databases; record and summarements.



rize expenses; write checks and record business expenses properly for an accountant; and possibly even prepare financial presentations.

All I have so far is a basic PC-compatible with 256K byses of RAM with monitor and printer. In order to do all the things I listed, I need to boost memory what a add-in card with another 384K and I will at least five programs, depending on what least five programs, depending on what features are offered by the programs latually buy. If I was fool enough to want to include graphe's with my financial presentations, I would also need a graphics adapter card and a high-resolution monitor.

#### IS THIS STANDARDIZATION? Each time I buy a new product, I am going to have to decide between as many as 90 possible brands. I am also going to have to make sure that it's compatible with all of the preceding pieces of the system, both hardware and software. If the program I want isn't compatible with the hardware I've got, I'll have to upgrade some of the hardware. And if I really knew what I was doing (which I wouldn't unless I had already owned a computer and used it for at least a year), I would probably want some way to integrate all these activities so that I don't have to keep quitting out to DOS, switching to a new directory, and starting a

new application. Is this standardization? In any case, I will have between 20 and 30 points of compatibility to worry about in building this particular system before I even get to the point of figuring out how to use all of these products efficiently, not to

#### ■ STEWART ALSOP

mention in tandem with each other.

Once I've got the pieces of the system hooked together and the software installed on the hard disk, I then have to worry about remembering which application (not

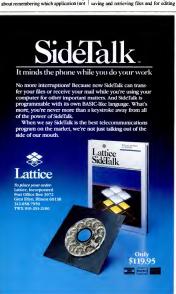
to mention its data) is stored in which subdirectory on the hard disk. I have to remember which application uses which command conventions and which keys for

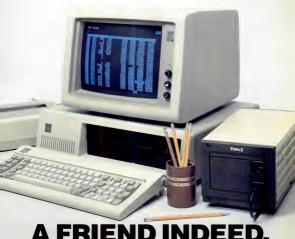
content. If I use any programs that are resident in memory, I must make sure not only that I load them into memory in the correct order but also make certain that they don't use the same "hot keys" and don't conflict with each other while in memory. Is this standardization?

Of course, by the time I get all this figured out, which will either take me about 3 months if I work at it full time or about 2 years if (like everyone feet) I still have to live my life and do my job at the same time, a whole new set of standards will have arrived plus a whole bunch of new technology that used to cest \$55,000 but will only cost me \$1,000. Do you call this standards will all the properties of the control of the cost of the standards will only cost me \$1,000. Do you call this standards will only the standards will not the standa

TOO MANY STANDARDS No, it isn't standardization, in the process of promotions and administration of the process of promotions of the process of promotions of the process of promotions of the process of management information synthesis for large corporations have had to slow own their companies purchases to figure down their companies purchases to figure of the process of the pro

replace his typewriter and his calculator? In its hurry to promote technology, the industry has focused on making big systerns work with micro-mainframe connections, local area networks, shared resources, integrated applications, and on and on. But the most valuable thing a personal computer can do is to solve our little day-to-day problems. Most people I know in the industry, who tend to know a lot about computers and how they work, still use Rolodexes, handwritten expense reports and checks, and paper notepads. But the computer can't deliver that kind of benefit when you have to get a screwdriver out every time you want to change a setting on your graphics board, when you have to pull a manual out every time you use a program you only use once a week, or when the plug/power supply for your modem won't fit into a standard four-plex outlet because there's already another, similar plug taking up too much room.





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ATblus20's unconditional and automatic park and lock feature really makes a difference.

Then, they threw the book at us. Actually, they dropped a rather heavy book directly on top of the drive GUESS WHAT?

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#### THE LAWYER'S 24.

The tests were so nasty that they had to publish the following warning: "We caution you not to perform any of these tests on your own equipment."

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Some found out the hard way. Many have been spared for now. If you use IBM's power machine and haven't yet taken remedial action, it may be just a matter of time.



# **Courting Disaster**

# The IBM PC AT

f you own an IBM PC AT and your hard disk hasn't crashed yet, don't worry—it probably will. If the experiences of PC Magazine's editorial staff, the Ziff-Davis Publishing Co., and a horde of other corporate and private AT users we've heard from are any indication, ownership of IBM's flagship personal computer and its 20-megabyte hard disk is surer to lead you and your data down the primrose path to be defined the statement of the thousands of PC ATs with had benefited the disk members when benefit about in user disk remarks when benefit about and the primarks are disk remarks and the primarks and the primarks

The crime scene at the AT theater usually plays something like this: You power up your AT on some bright sunsay morning, thinking it's going to be just another normal working day. Clouds darken the sky when, after the AT's power on self-test (POST) routine finishes up, the usual whining of the floopy disk drive and whoosh of the hard disk is followed by an ominous message on your screen, right about where the memory-check messages had just appeared.

"Disk Boot Failure," it says.
You inhale deeply, perhaps even gasp,
as you pull down on the big red switch to
shut the machine off and remove the offending message from your life. You
hought you'd escared, that yours wasn't

one of the thousands of PC. ATs with hard disk problems you had heard about in user group meetings and read about in PC. Magzaine and other computer and business journals. Everyone said the hard disk problem was real, but yours had kept on working, belying the rumors that the IBM AT was a seriously flawed machine. But there it was, serious evidence of a failed hard disk in your AT. . . or was it just a random error?

Is the AT's hard disk a serious flaw in an otherwise solid product? Does the AT have other hardware problems to contend with as well? Or is the whole AT horror story just the wild rantings of scandalmongering journalists? Play out the rest of the scene, and see for yourself.

fending message from your life. You thought you'd escaped, that yours wasn't back up again, hoping against hope that the



arly on, IBM denied there was a problem with the drive . . . . They just looked at it and said, 'No, you guys are all wrong. There's nothing wrong with the drive.' ??

resident of a hard disk manufacture

message was a random error and that your disk is in good shape after all. The cloud gains a silver lining as the AT's Intel 80286 processor carries it through its POST and the DOS boot routine, loads your device drivers, and runs your AU-TOEXEC.BAT program. All systems appear to be go as you boot your favorite spreadsheet, word processor, or whatever it is that keeps you eating your daily bread.

OMINOUS MESSAGES But the nightmare is real, and soon, perhaps not that first day, but sooner than you'd expect, those dark clouds will reappear when you attempt to retrieve or save a file on your AT's hard disk. DOS or your program cannot cooperate; you'll be confronted with:

General Failure Reading Drive C:

or, perhaps more ominously.

Disk C: Not Ready Abort, Retry, Ignore? messages cluttering your screen.

It's too bad the ominous messages aren't all there is to it or that there isn't an easy way to recover from what's causing them. The sad truth is that the AT's 20-megabyte hard disk or its disk controller has either started to fail and is taking your data with it piece by piece or has failed completely and will never work again. The data you were trying to work with is proba-

If you were trying to retrieve that file, it's lost, or at least most of it is. If you were trying to save it, you might be able to save it onto a floopy disk (if you happen to have a formatted one handy), but DOS mayhave gone ahead and crashed beyond all recall

bly gone.

by that point. It may not matter much what you try to do because DOS's health is determined by just how far things have gone awry on your AT's hard disk. You may not be able to salvage the file of the moment but there's hope for the rest of the data on your AT's hard disk. When you start up the AT again,

things may still look normal. It's actually possible, for example, that the file you were trying to retrieve is still there and in one piece.

Things may look normal for a while, even weeks, but in all likelihood the same symptoms of hard disk problems, or still worse ones, will appear. The worst symptoms crop up when your hard disk is totally gone; no amount of repowering the AT will bring the disk, your data, or sanity back into your life. When that happens, the AT's BIOS programs will no longer recognize the hard disk's presence in the machine and, no, rerunning the Setup program to reassure the AT's nonvolatile configuration RAM of its presence will not fix the problem.

BACK TO BASICS Starting your AT without a bootable floppy disk inserted in drive A: will probably land you in Cassette BASIC, which is, at best, a horrible embarrassment for the owner of IBM's most expensive micro. After all, it doesn't even have a cassette port.

run DOS, things may

seem OK-the apparently fried hard disk will reappear on occasion and boot the machine normally. But things certainly aren't OK, because your \$2,000 IBM disk is a gone turkey that has bad data sectors or. worse, bad sectors where

the boot record, file allocation table (FAT). DOS system files (IBMBIOS-.COM and IBMDOS.COM), or root directory are stored.

symptoms, it's reasonable for you to run the Diagnostics program supplied with the IBM Guide to Operations for the PC AT. The hard disk analysis routine in the program will either declare the disk to be healthy or refuse to recognize its existence in your machine. It will probably not detect the bad sectors on the hard disk that are the cause of your problems. Despite the bad information from Diag-

nostics, you undoubtedly have bad sectors on your AT's hard disk. Running The Norton Utilities Disk Test (DT) program (developed by PC Magazine columnist Peter Norton) will inevitably tell you that there are bad clusters (disk sector groups defined by DOS) and where they are. Some of the flawed areas will be occupied by your program or data files (DT can also tell you which files are in trouble), while other clusters will be unused. DT will politely offer to mark unused ones as unusable. That way, DOS will not try to use them for storing new data. If you don't own the Norton program. Charles Petzold's DISKSCAN.COM program found in this issue's Programming/Utilities column will tell you about the location of any bad disk sectors.

Unfortunately, there's nothing that PC Magazine's best DOS and disk gurus can do for the bad disk areas that contain files except suggest that you try your best to recover the data and hope you have it backed up somewhere else (see this issue's Peter Norton column, "Down with the PC AT. Up with the Compag 286," for his account of hard disk failure).

It doesn't matter, however, because From this point on, whenever you try to your disk is gone, and, even if you allow

> f vou have a bad day, it's no big deal. If IBM has one, it's a shot heard round the world 99

DT to mark off the bad spots, more will show up as you continue to use your AT. If you're lucky, your boot record, FAT, DOS system files, and root directory are in After encountering any (or all) of these good shape and you can recover some or

Despite repeated bouts of hard disk terror, executive editor Paul Somerson remains true Blue, a fervent believer in the virtue and value of those three magic letters.

The way a lot of people figure it, this skinny little matte-finish sliver of aluminum goes for upwards of two thousand bucks. After all, you can take home a stripped-down PC's Limited AT and someone's grainy monitor for maybe half what it costs from IBM. To these people, computers are all the same under

the skin, just a commodity collection of the same resistors, cables, and chips.

Wrong. If all you're ever going to run is one or two standard, well-behaved applications, and you're the kind of pennypincher who buys generic old washes and reuser paper cups, such work-almost-alikes may fit the bill. But if you ask me, that little square inch of aluminum is worth every inflated cent.

Sure some machines out there come pretty close. AT&T's hardware isn't bad, and I wouldn't turn my nose up too far at a Compaq Deskpro 286. Tandy's boxes have gotten a lot better. You get the feeling these three companies might be around

next year. But with IBM there's no question. Something tells me that even if world leaders charcoal-broil the earth's surface, IBM would find a way to weath-

Really now, if you buy a "Computers 'R' Us" brand AT, will you be very surprised next month when all a frantic call to their tech support line gets you is a scratchy recording with the words

"we're sorry" at the beginning? Yes, IBM has pulled some fast ones. Every single AT in our offices has crashed at least once, and I'm working on my own AT hard disk number four. But the silver lining is that it forces me to be absolutely currently backed up. And using my computer now has an extra dis-

mension of terror that is—well—exhilarating, like driving a fast car over a wet Alpine pass. IBM's no-nonsense policy is that it'll take your busted part and hand you a new one overnight. Try that with some other companies. Unfortunately, unless you insist on IBM-only parts, they may hand you someone else's recondi-

IBM

Personal Computer AT

tioned CMI drive in exchange for your lemon. So nobody's perfect.

Why else am I mue Blue? IBM's keyboard is to vastly superior to the sporplastic toys foisted off by other manufacturers that alone is nearly worth the surcharge. The only way competitors are origing to sight off business is to beat IBM's prices by a mile, and that means cutting corners on quality. When the surtice of the surface of the surface of the surface oldiars. As Sommers Mangham said, "My tastes are simple; I want only the best—and there's processoil little of that."

As long as software authors are going to write naughty code that looks directly at hard ROM addresses, I want an IBM ROM that's not going to freeze the pro-

gram, blink away my data, and send the computer to never-never land. I also spend a good deal of time with BASICA. Not GWBASIC, or some other nearmiss. Half the stuff readers send in to PC Magazine's back-of-book productivity columns works fine on IBM equipment

but blows away even fairly decent clones like Compaqs; I shudder to think what it would do to some \$498 monstrosity made in Bulgaria.

One of the biggest problems with certain kinds of non-liked so with certain kinds of non-liked ball hardware is that you end up with pieces from several different vendors. You buy two things that plug into each other and when the doesn't work, both suppliers give you the old "Sorry, that" so Korry, that "so Korry, that "so korry, that "so korry, that "so korry, that be better that the problems it is his fault." IBM may have sold some flaky drive, but they're the best one-stop shopoine center around.

Don't get me wrong. I'm not wild about IBM speed governors that prevent you from juicing up your AT crystal. Or the Mickey Mouse arrangement of piggyback RAM chips sold at a fierce

premium. Or the overpriced and nonstandard floppy drives. Or the strange new AT serial port. And the smoke is still coming out of my ears from my most recent hard disk fiasco. I should have suspected something when it made a notice somewhere between a lawrenower choking on wet endapses and a popcom maing on wet endapses and a popcom dead in its tracks, so to speak. If I never see the message "General Failure error reading drive C' Abort, Retry, Ignore?" ever again, it's too soon.

But when IBM comes out with its 80386 supermicro, am I going to burn the phone lines to my dealer and order the first one he gets, sight unseen? You don't have to ask.—Paul Somerson



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January 29, 1986

Mr. Robb Wilson IBM Corporation Entry Systems Division 5201 South Congress Boca Raton, FL 33432

# Dear Robb:

As we discussed, below are the questions we would like IBM to address regarding the seemingly high percentage of hard disk failures on PC.
ATS. For the record, I want to restate that PC Mayaline's interest in the property of the property

### Here are the questions:

- Are there interactions between the drive and controller that cause or exacerbate disk failures? If so, can they be corrected in the field or are they too embedded?
- Were there any software problems in DOS 3.0 or BIOS that caused or exacerbated the problem? If so, how have they been corrected?
- 3. Are there improper procedures in converting from DOS 3.0 to DOS 3.1 that can cause problems? If so, what are they?
- that can cause problems? If so, what are they?

  4. Can the original install of the hard disk be done incorrectly so as
- to cause problems later?

  5. What percentage of the 20 MB drives in PC ATs have failed?
- 6. What are the prospects for future failures of those that haven't?
- What is IBM's warranty policy for CMI drives? Does it extend beyond the normal 12-month period?
- 8. Machines 14 and 15 months old have been serviced under "extended" warranty. Who is paying?
- Are disk failures in any way related to clock speed? Do owners who accelerate their ATs with faster crystals run a significant risk of accelerating the failure of their hard disks?

Thank you for your cooperation in addressing these concerns.

Bill Machine

Bill Machrone Editor-in-Chief

Editor Bill Machrone expressed PC Magazine's concerns about the AT to IBM in late January. The compony's response is on the facing page and is numbered point by point, I through 9, to correspond with Machrone's questions.

# IBM RESPONDS: A STATEMENT ON PC AT QUALITY

IBM responded to editor Bill Machrone's nine questions(facing page) in this point by point rebuttal. The statement that follows is reprinted verbatim.

I man eo fiss Personal Computer AT since the producer of its Personal Computer AT since the product was announced in August 1984. We have listened to our customers in both large and small accounts. We have listened to our dealers and to un sales, service, and distribution network. We have conducted extensive opinion surveys to more fully analyze and understand the customer's level of satisfaction with the AT.

Opinion surveys conducted for IBM indicate that the overwhelming majority of AT owners are satisfied with their machines. Our warranty and repair data support this finding. To be sure, we have received some reports of problems with the machine's fixed disk drive. IBM consistently has acknowledged receiving such reports. We have evaluated those reports and taken whatever corrective action has

been necessary.

To IBM, this is an ongoing process. If a customer is not satisfied with our prodcut, we'd like to have about it. If we do
termine that a problem exists, we notify
customers as soon as possible. For example, when we became aware last year that a
faulty adapter card component, we
questly informed our customers. Charge
questly informed our customers. Charge
the control of the control of the control of the control

to help them easily determine whether
their museline was affected. As with any
other IBM product, our gout then, as it is
now, is to ensure customers assistance.

A close level of interaction between the controller and the fixed disk drive is, of course, necessary for proper system operation.

As you may recall, last summer we notified our distribution/service channels that a faulty component could cause difficulties in less than 10 percent of AT controller cards. As part of last summer's program, we supplied customers with

test diskettes to help the customers determine quickly and easily whether their ATs contained the faulty component. If

so, the adapter card was replaced. To answer your immediate question, we are not aware of general or widespread interaction problems between the controller and the fixed disk drive. If a customer should encounter difficulties, we have diagnostic procedures available that can isolate the difficulty to either the controller or the fixed disk drive. These diagnostic procedures can be followed easily in the field.

None that we're aware of.
 No, if customers follow the proce-

dures outlined in the appropriate IBM documentation.

4. Sure—and an incorrect fixed disk drive installation clearly could lead to

drive installation clearly could lead to customer problems. Examples of incorrect installations can include poor cable connections or physical mishandling of the fixed disk drive. It should be emphasized that the fixed disk drive is a sophisticated component that can be damaged through improper handling. Those points aside, we don't believe incorrect installation of the fixed disk drive is a significant or widespread problem.

5. We confidential. Historical to the several customer surveys on the AT that have been conditioned to the several customer surveys on the AT that have been conditioned for IBMs, an overwhelming percentage of AT owners toll us they're stairfied with the system conditions to the several customer surveys of the condition of the several percentage of AT owners who may have encountered a problem, we'd like to know about it so that we may take the necessary corrective action.

 We anticipate that customer satisfaction with the performance of our AT will continue to be high. Again, the overwhelming majority of AT owners have

indicated to us that they are satisfied with

IBM's normal warranty for Personal Computer AT products is I year.
 That term has not changed since the product was announced.

8. IBM does not offer an extended warranty on the Personal Computer AT. IBM has various channels that provide customer support, including our authorized resellers, the direct sales divisions and, in certain cases, the manufacturing site. On occasion, out-of-warranty service may be performed by an IBM sunport organization owing to unusual circumstances or in order to gain additional information regarding machine performance. A recent example of this practice is the AT customer satisfaction program announced last summer, in which IBM replaced faulty adapter cards in a limited number of ATs. This program was conducted at no charge to the customer, even for those machines that were no longer covered under the 12-month IBM war-

ranty period. 9. First, customers should understand there is a risk any time a machine is operated beyond that machine's stated specifications. The AT is not an exception to this rule, and IBM does not support use of the product beyond the test specifications. Further, IBM does not routinely test products beyond the specified limits. Because of this, it is difficult for IBM to state conclusively that a problem may or may not exist beyond the test specifications. In terms of general engineering guidelines, however, we have no evidence that an altered clock speed will lead to problems with the fixed disk drive. We have consistently maintained, however, that altering the machine's speed may, generally speaking, yield unreliable results, and we stand by that statement.

"And while the failure
rate has gone down considerably
in the last of months, any time
that an AT goes out the
door, its chances of coming back are
greater than for any other
machine. Compags are a lot
more reliable 32

marketing rep. for a retail chain

all of your data by copying it to floppy disks (use COPY instead of BACKUP to avoid spending an inordinate number of hours telling BACKUP to ignore bad data sectors)

Sectors).
You may not be so lucky, however, especially if you got the "Drive Not Ready" message, or you landed in BASIC, or Diagnostics refused to recognize the presence of the hard disk. If you did, you've got instant dissater on your hands because there is almost no hope of retrieving any of the data from your hard disk.

D.O.A. When you take the AT back to your authorized IBM dealer (and I strongly recommend you do), the IBM-supplied Advanced Diagnostics program used by the technicians there will agree with DT's or DISKSCAN.COM's analysis and declare those disk areas (Advanced Diagnostics works in cylinders and tracks) to be unusable for storing data.

When the AT first came out, dealers recommended reformatting a troubled hard disk using the Advanced Diagnostics formatting program. That way, but sectors would be correctly marked off and the disk necestically restored to normal service, albeit with less usable space. They no longer does because dealers have found that a reformanted disk usually returns to the shop sectors. In any case, if the bold areas ser the ones reserved for the boot record, FAT, DCS system files, or root directory, FAT, all over no matter what Advanced Diagnostics this took.

Your dealer will replace your AT's

hard disk with a new one supplied by IBM unless you request something plus. The official warranty period for the AT and tis disk is I year from the purchase date, but IBM seems to have an informal policy of replacing failed hard disks that are older than that free of charge. A different model disk will cost you. If

the alternatives are, check out contributing

editor Winn L. Rosch's cover story sidebar, "IBM AT Hard Disk Difficulties and Alternatives." He tells you which compatible disks you can use to upgrade an Entry Model AT, or replace the CMI drive you already have in your Enhanced AT.

THE FACTS, MA'AM If you think I'm guessing about what happens when an AT hard disk falis or making up horror stories you can use to prevent sleeping sickness, think again. The scenarios described here are based on the combined experiences of the upper chelon of officers and staffers at the Ziff-Davis Publishing Co.

Let's start with the 2-day period a few weeks ago when four AT hard disks went

belly up here at PC Magazine. First it was the hard disk in elidor Bill Machrone's machine, which had operated flawlessly for 13 mentis. "The disk had worked for so long I had become almost cocky about it," he said. "When is failed, I tried everything around to save the data, but sectors kept dropping out faster than I could copy the data on them. Files were there that I'll just never see again."

Then it was new-products editor David Obregón's AT. "#@\$?!" he cried, "there goes the database." In this case, it was PC Magazine's invaluable product and vendor-profile database, which was fortunately well backed up.

Like activity editor Paul Somerson had the worst happen is both his public and private lives the next day. In the morning it was the hard disk on his AT at PC Magazine's editorial offices. "Oh well," he phis hoophized as he wisted long needles into the heart of a voodoo doll dressed in a tiny white shift and blue suit." I have copies of everything safely tucked away on my hard width and the safe. "Dickinson, how are you at reconsistent of the safe of the saf

It had seemed incomprehensible to him that both his AT hard disks could go south the same day, especially since he treated his home machine as gingerly as if small,



fragile bottles of nitroglycerin were mounted on the motherboard. The guy would practically park the heads each time he snapped a diskette door shut. "Can't be too careful.

Unfortunately, he wasn't. "I never used to set VERIFY to on." Somerson lamented, "It slowed DOS's copying process down too much." His only real back-

> here's an IBM/CMI connection. IBM owns part of Intel, and Intel owns part of CMI. ??

> > -president of a hard disk manufacture

tems Division in Boca Raton, Florida. When the local ComputerLand technician installed the disk. IBM requested that he replace every removable IBM-supplied part in my AT, including the power supply. The company also insisted I install one of the earliest copies of DOS 3.1. IBM wanted to be sure of something but never told me what. After 6 months of light use.

that disk is still working. but most of my data resides on Iomega Bernoulli Box disks because I trust them a great deal

more than the zero-defect hard drive supplied by IBM. WIDESPREAD DISAS-

ups were on flaky high-density floppies, and many of his files failed to copy properly. These days he copies in triplicate, and now that his dealer replaced the CMI hard disk with one made by IBM, things are pretty much back to normal-except that IBM's hard disk is not exactly the quietest one on the market. Or, to paraphrase the way Somerson puts it, "The thing sounds like a lawn mower with bad bearings choking on wet crabgrass."

Even as I sat at my AT writing this article, contributing editor M. David Stone called. Our "gentle giant" sounded a mite bitter as he told me that three files on his AT's hard disk had just turned to dust. He had, it seems, been planning a short piece for this issue on how rock-solid his yearold AT has been.

That's not to mention the AT that operates PC Magazine's Interactive Reader Service (IRS). Two brand-new ATs lost their hard disks in 2 days (and you thought we just took it off-line to annoy you). Then there was editorial vice president Jonathan Lazarus's AT, along with others scattered throughout Ziff-Davis headquarters in New York. All of their hard disks have failed in the past 6 months.

By the time you read "The AT's Slipped Disk" in PC Magazine (Volume 4 Number 13), the AT I have at home had chewed up four hard disk drives. It ate one more after that. The last one installed was delivered with zero defects (that's very unusual for a hard disk) because it was handselected by engineers at IBM's Entry SysTER At Ziff-Davis we are, it turns out, but a microcosm of hard disk disasters among AT users. Other reports from around the country are just as troublesome and associate editor Charles Bermant and senior editor Bill Howard have compiled several of them in "From Sea to Shining Sea."

The AT's 20-megabyte hard disk is only the biggest and most widely heralded problem with the AT. Manufactured by Computer Memories Inc. (CMI) under contract (until recently) by IBM, the disk has self-destructed in a large number of ATs, but that's not all that's wrong with the computer. The AT's disk-controller card, which is made for IBM by Western Digital Corp., was found to have a faulty logic chip, and IBM issued a special diagnostic program and field repair order to locate and correct the problem. Also, the cables connecting the disk drive to the controller have been plagued by faulty connectors that tend to slip apart and may cause hard disk crashes or at least unreliable op-

eration. NO COMMENT We tried to interview engineers at CMI and Westem Digital, but no one is answering the phones, at least not if you're in the computer magazine business. But senior editor Bill Howard found A1 Stone on Long Island, New York, Stone, a value-added reseller, is holding a barrelful of faulty CMI hard disks.

That's just hard-disk-related problems with the AT. Many users have also suffered from faulty motherboards that fail suddenly, often taking hours or days of work with them. Two AT motherboards failed at PC Magazine recently, including the one in Somerson's machine (poor guy, it happened the day he got the CMI disk replaced). Machrone wrote to IBM concerning "the high percentage of hard disk failures on PC ATs." His letter is reprinted here, next to "IBM Responds: A Statement on PC AT Quality." If you want to stay away from Big Blue but still have the power of an AT on your desk, take a look at editorial assistant Christina Dyar's compilation of AT alternatives that we have previously reviewed in "Power Computing: Alternatives to the IBM AT."

IBM's PC AT has set the standard for powerhouse personal computers. But its flagship PC has undisputable hardware problems that have taken millions of megabytes of data, along with countless frustrating hours of user and technician time. with them into the proverbial bit bucket,

The biggest problem of all is IBM itself and its attitude toward both the flawed machines and the unsuspecting customers who have bought them. IBM refuses to acknowledge that the AT has any hardware problems at all other than the logic chip problems on the disk controller. The company's standard line is that "the failure rates of the AT and the CMI disk drive are not above normal expectations.

Those words have an exceedingly hollow ring to AT owners and users whose work has gone up in a cloud of broken bits.

o one at IBM would tell you anything. You had two choices: panic or wait around. The attitude bothered me more than having the hardware fail. 99

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SIMPLY THEBEST

- VI

Dealers, distributors, and users across the country report AT problems, suspect several causes, and see some evidence of improvement.

# <u>From Sea to</u> Shining Sea . . .

ow serious are the maladies befalling the IBM PC
AT? Since IBM considers the failure rate of the
components a proprietary—not to mention embarrassing—matter, it wouldn't tell us, and so PC
Magazine took a different tack to find out. We talked with
major computer stores, value-added resellers, corporate buyers, and users for an indication of the scope of the problem.

The reports that came back from interviews across the country indicated that the most prevalent problems, in descending order of significance, are with the AT's 20-megabyte CMI hard disk drive, the Western Digital controller board, and possibly with a combination of the two in the same machine.

Our reports show that no one managed to mask PC Magazine's 240 percent failure rate for hard disk drives among the Parker ATs in-house or used by editions at home, a total of 12 dead drives including replacements. One reseller found a 60 percent failure rate ou noe shipment of 50 CMI drives. Many reported failure rates considerably lower, but high enough to be of concern. Some reported maintain problems. Several dealers observe that more than the problems were worse in the AT's earlier mobilem were worse in the AT's earlier

days and that IBM was responsive to the problem, quick to honor warranty

Sensitivity to IBM's size and clout led a number of dealers and suppliers to share private concerns about the AT's reliability but to go on the record with "no comment." No one suggested pressure as the reason for silence, merely allegiance to the cardinal rule, Don't bite the hand that feeds you.

THE BIGGEST FRAUD After PC Magazine's experience, the hardest luck story belonged to Al Stone, a principal in the computer services division of a Long Island, New York, company that distributes computer components to dealers and original equipment manufacturers, including hard disk drives for owners of

### ■ REPORTS ON PC AT PROBLEMS

unenhanced PC ATs in the greater New York area

"I believe that the CMI drives are one of the biggest frauds ever perpetrated on the American public," Stone says.

"Computers are a business and a hobby for me. I've been president of the Long Island Computer Association, and

statistics on AT failure rates. Businessland even recommends the CMI, along with disks from Tandon and Seagate, as an add-on hard disk for the PC and the XT. And one leading subsystem manufacturer is currently leaning toward installing CMI disks in its units.

Al Harding, who owns Computer Land stores in Santa Fe.

Land stores in Santa Fe,
New Mexico, and Lubbock, Texas, estimates
that the AT originally
had a 20-percent failure
rate but says the rate has
improved in the last few
months. His strategy
hasn't changed, however. "We had a lot of

er. "We had a lot of breakdowns, so we started putting in our own non-CMI disks," says Harding. "We put in disks with 40 and 70

megabytes. It gave us a better profit margin and gave the customer more horsepower. Now that the machines work better, we

haven't switched back."
"The failure rate used to be a lot worse," says Mark Mitcham, senior marketing representative for Businessland in Albuquerque, New Mexico. "The number of pure IBM systems we

marketing representative for Dustinessland in Albuquerque, New Mexico.

"The number of pure IBM systems we sold is almost inil. We built most of them up ourselves. And while the failure rate has gone down considerably in the last 6 months, any time that an AT goes out the door, its chances of coming back are greater than for any other machine. Compass are a lot more reliable."

An Entre salesman says the AT fails
"no more and no less than any other IBM
product."

Many dealers commented; some didn't want to be identified beyond their hometowns. Richard Bell of Seattle

says, "The AT failure rate is less than 10 percent. For a while it was higher, 15 percent . . . . IBM has now corrected the problem."

Gary Nielsen of Phoenix, Arizona, puts it this way: "The problem with the controller card was a manufacturing defect. On the IBM AT hard disk, initially we had a lot of problems. Now they're going away, although the AT disks seem to be a little bit more fragile than normal hard disks." Comments a dealer in San Matco, California. "We don't keep percentages;

... when there's a failure, most of the time it's disks or disk controllers." And another in San Jose, California, says, "The ATs that we're seeing right now have cleaned up their act. The failure rate now is about the same as with PCs—not significant. When we first had them, the

failure rate was about 50 percent. If anything does go wrong, it's usually the controller card."

lems with the disk.

CONTROLLER'S FAULT? Joc Castron, a seller of medical vertical-market systems in Coram, New York, says, "In my opinion, CMI did not make the best piece of apparatus, but the major problem with AT's lies with the controller, either in timing or data separation. You can't find an accurate place to lay the blame. It's partly with IBM and partly with CMI. If IBM's controller were more reliable, you wouldn't have such prob-

"Even with a lower-end hard drive." Castoro says, "the controller can make up for a lot of sins. It can recover from read errors. With the AT, there were a lot of nonrecoverable errors. A good controller can make a lower-end disk— CMI's or anyone else's—less of a problem."

Castoro says he is shying away from using ATs in any configuration unless the customer insists. He prefers to use a PC, PC-XT, or PC-compatible with an accelerator card to match the speed of an AT. If a customer needs an AT-compatible, Castoro recommends using a Spery: "It's faster and more reliable; ... there

he number of pure IBM systems we sold is almost nil. We built most of them up ourselves. ??

marketing rep., retaile

don't think the problem has anything to do with the disk controller. I've seen CMI drives fail on Xebec and DTC controllers, too. They fail just as readily in an XT as in an AT. 32

I saw the opportunity to be a major supplier of CMI drives in the Northeast as a chance to grab the brass ring. I was hurt by this. A lot of little guys were hurt very badly.

"In one 50-unit order of 20-megabyte CMI drives," he laments, "I had 30 defective or dead on arrival. "I don't think the problem has any-

thing to do with the disk controller. I've seen CMI drives fail on Nebee and DTC controllers, too. They fail just as readily inan XT as in an AT. "Stone says. "The CMI exhibits a lot of temperature sensitivity. If you format the drive when it's cold and then write and read when it's warm, it's act you're going to get lost clusters."

stantial. For instance, he says, "We were supplying drives to Novell for use in a large networking system. There were problems that Novell couldn't solve; it thought it had software bugs. We switched to another brand of drive and the problem went away."

USED TO BE A LOT WORSE None of the larger computer chains—Businessland, Entre, ComputerLand, or Sears Business Centers—says it keeps hard

# THAT SINKING FEELING

Core International's outspoken president, Hal Prewitt, makes good on his promise to give AT drives a burial at sea—and takes IBM to task.

Poaters and fishermen off the coast of Florida should update their charts to indicate a new navigation hazard: CMI Reef. In late February, a crew of Core International workers steamed into the At-

lantic with a cargo of crashed Computer Memories Inc. (CMI) hard disks. A mile east of Boca Raton ("in plain sight of IBM's sales offices," notes 31year-old Core president Hal Prewitt), the boat, a 46-foot fishing craft aptly named the Megabyte, hove to. Prewitt reached down, hefted an original IBM-issue AT hard disk from a gleaming pile in deck, and tossed it

deck, and tossed it into the drink. It made a frail glugging sound, sort of like an IBM executive swallowing hard.

Prewitt's shipmates pitched in, flinging the dense metal canisters over the rail. After many minutes, the pace slowed to a crawl. It's hard work, throwing disk drives in the ocean.

The sea floor in no normally the home of so many high-capacity, 40-millisect ond hard files, especially when the y're check full of data. Archaeologists from the 50th century will have a field day exploring this site. Until then, the hardware will, in the words of Mario Pazzo, sleep with the fishes. This was certainly in the back of Prewit's mind when he devised the stunt. Why does someone throw a million back's worth of computer parts

overboard? "Because we guess they're good for fishing," he says wryly as another CMI splashes into the sea. "We already know they're not good for computer data."

de into the Ak | er data." | their computer sy

the middle of the "CMI Reef" might provide a better home for fish than these drives did for data.

For 3 months in 1985, Core ran fullpage ads slugged "The Great Recall" in every PC-oriented magazine. "Boca Raton, home of the IBM PC, needs a fishing and diving reef, too," the copy smirked. "Help us build the world's first lowtechnology artificial reef." The deal was that if you bought one of Core's 40-megabyte hard drives (for \$2,595), then plucked your original 20-megabyte drive from the AT chassis and shipped it back to Core's Boca Raton plant, the company would mail you a check for \$1,000. And it would deep-six the CMIs that were returned, "simply because that's where they belong.

Well, the ad didn't exactly name CMI in black and white. But Prewitt doesn't pull any punches when you ask him in person. "It's generally our feeling that it was just a bad drive. It's unfortunate that it was ever sold. I would never recommend that anybody ever use that drive in their computer system, and if they can

get rid of it, they should take the time and do so."

The way he sees it, "The drive simply exceeded its overall design capabilities. It tried to get too much out of too little." Instead of dedicating an entire hard disk platter surface as an electronic road map for the heads, CMI's wedge-servo technique cut corners by packing small bits of positional information in with the data it.

self, according to Prewitt. Rather than use a fast, accurate voice-coil to move the heads, CMI relied on yesterday's clanky stepper-motor technology and an optical feedback device that could be easily thrown off by contamination inside the drive "like a hand in front of your eyes." Unfortunately, the contamination was usually in the form of little pieces of your data floating on oxide dust kicked up when the heads plowed tiny furrows into the surface. This happened all too often, since the CMI drive didn't automatically retract the heads when the power turned off: instead they would drop down and sometimes take a bite out of whatever data they happened to be hovering above. Prewitt says he considers automatic head parking and locking to be ("That Sinking Feeling" continued)

"the single most important feature a disk drive should have in a small businesscomputer system."

Although Prewit is one of the largest authorized IBM dealers in the Southeast, be thinks IBM "has made a let of mis-takes." There's no question about that... For the first time users are willing not to buy a 100 percent IBM system after getting burned so badly. Today alto groupters are created equal. Any was also and really look for is knowledge and experience and quality. That's what made IBM famous. That's what made IBM famous. That's what made IBM successful. They delivered one-stop

shopping, the total solution. IBM has gotten away from that. They now concentrate on being the low-cost volume producer—and you don't see the word quality in there.

"They've done a lot of things that are very nice," Prewit is quick to admit. 
"The general design of the machine is one of a very good, well-hought-out architecture. But if you're not a computer expert yourself, you have to depend on somebody for information. And sufformately you can't get that from IBM these days. The company has never been structured to handle that on the small-end marteplace. You could get it if you had a

million-dollar computer, but you don't get it if you are buying PCs." Back when IBM was designing the

AT, says Prewitt, CMI was making the only 40-millisecond drive available at an extremely good price. "The closest competitor was at least double the cost, so they really had no competition." And, anyway, as Prewitt reminds us, "you gotta remember the IBMCMI connection. IBM owns part of Intel, and Intel owns part of CMI."

These days IBM is manufacturing its own 20-megabyte AT drive in its Rochester, Minnesota, plant, with voice-coil technology, heads that retract automati-

# "ADMITTEDLY, THERE WERE SOME PROBLEMS"

A spokesman for CMI says the small company was overwhelmed by the IBM order and has now corrected the production problem.

Was the reputation of Computer Memories Inc. unfairly blackened by l'affaire IBM? Yes, says at least one observer—CMI itself.

"An unfair number of complaints related to the integrity of the IBM system were laid at the doorstep of the CMI disk drive," says John Trifari, a spokesman for the Chatswork, California, company. "When you get an error message on-screen, it doesn't shere's a controller problem or a computer problem—it says there's a disk problem.

"Admittedly, there were some problems when the company started up. This was a small company that had a finite production capability and it was called upon to deliver very Jarge quantities of disk drives," he says. CMI almost tripled in size in 1985, primarily because of the BIM contract, according to Trifar. It went from a \$47-million-ayear company in the fiscal year ended March 1984 to one whose peak revenue was \$50 million in the second quarter of

IBM contracted with CMI for 240,000 model 6426 two-platter, fourhead, 5¼-inch, 20-megabyte disk drives through the end of 1985, Trifari says, and ordered an additional 8,000 in October 1985 (an indication that IBM wasn't unhappy with CMI's product). That order accounted for 60 percent of CMI's business during the course of the contract

contract.

According to Trifari, the problem with CMI drives was a linkage to the read/write heads that came unaligned in shipment, causing the drive to go off track. CMI strengthened the linkage and developed a "drive electronics reporting position" facility to help the read/write heads find track O regardless of linkage noblems.

"That problem was corrected," Third rissys. "We feel the problems have been resolved that related to the drive." CMI actually had one other problem with the drive—patent litigation over its design. In an out-of-court settlement with Quantum Corp., CMI has agreed to stop making the troubled 6000 series (20.9-, 31.5-, and 41.9-megabyte drives) as of the end of April 1986. (CMI will then make only a new 7000. series of 53-and 88-megabyte drives).

Until recently, anyone who bought a PC AT with an official IBM 20-megabyte hard disk got a CMI 6426 drive. Some ATs still in stock contain CMI drives. The 6000 series drives were, and are, also sodd to distributors and mail-order houses.

CMI notes that IBM violated its own rule when it chose CMI to make the drives: Never use a single source for components. "So, when there were difficulties with the system," Trifari says, "IBM was forced to put the [hard disk! AT on severe allocation."

Until the AT came along, Triafu is asys, "The industry was essentially asys, "The industry was essentially company to the state of the

"CMI really deserves a pat on the back for the way it pulled it out," Trifari says. "The drives really work well now."—Bill Howard cally, and a dedicated servo positioning surface. But if your current CMI drive goes south, don't expect an IBM-made upgrade, cautions Frewitt. "All they're doing is putting the same drives back in. If you get lacky, maybe they'll put in the Rochester drive, but there's a good possibility you'll just get a refurbished CMI drive, or the other standard IBMI drives. But they will be sufficient to the control of the control of

SHARING THE BLAME Previt is so sure CMI disks will fall that one of his favorite slogans is "Not If But When."
Still, while most critics acknowledge that ATs are not exactly the most problems of the control of the co

The hard disk controller was indeed buggy, says Prewitt. It had to do with a chip-a PAL, I believe-that had a floating circuit and under certain conditions could cause some erroneous information to be transferred to the drive. But we were never able to document a single failure absolutely caused by that chip and that controller. However, IBM certainly did the right thing by having the controller card recalled and replaced. We didn't feel it was the major problem. It was also relatively inexpensive for them to replace the controller card compared to recalling and giving you a different disk drive. We believe the reason they didn't do it with the drive is simply the cost."

What especially irked Prewitt was the way IBM handled the problem. "Early on IBM denied there was a problem in the drive. . . . They just looked at it and said, "No, you guy sar call wrong, there's nothing wrong with the drive." And then when they realized there was a problem and stopped the AT production line in January, their comment was, "Well, you

can't get enough ATs because there's a shortage of disk drives from our primary supplier. The one thing they left out of the January statement was that they couldn't get enough drives that worked in the ATs."

But while no Big Blue representative has yet gone on the record and admitted the problem, Prewitt's internal IBM contacts have told him a different story. "I have never spoken to an IBM technician or engineer in Boca . . . who denied there was a problem with the drives. They did tell me there was a problem.

that they were working at it had, and that they were going to fix it. They really stepped up a tremendous amount of esting. They had CM (open a repair facility here, and at one time there amount of esting. They had CM (open a repair facility here, and at one time there did not be to the control of the con

testing. "The defective CMI drives piled up quickly. "After IBM realized there was a problem, they tried to screen out drives that had a high probability of failing," reported Freuti." Useful generally guest that it would be really asset that it would be really successful as the second of the test of the real that the second of the probability of the real that the second of the second of the real that the second of the

Prewitt says part of the problem is that users don't understand that high-performance disk drives are complex, highstrung devices requiring extensive diagnostic testing. "If you buy a drive directly from a manufacturer or from a mail-order house that's just supplied directly from a manufacturer, there's at least a 20 percent chance it will fail, or not work, within the first 90 days. Many vendors do no testing whatsoever on the

"Today all computers are created equal—it's a commodity market. What you should really look for is knowledge and experience and quality. 39

president of a hard disk manufacturer

drives. They simply treat them like other circuit boards or monitors."

While Prewit originally hoped that he'd end up with "thousands" of returned drives, fewer than a thousand actually made it over the side. Interest, by, when the promotion was in full swintually made it over the side. Interest, by, we we contacted by "just about every sids drive require house in the country, wanting to purchase the broken CMI drives. They get thousands of them in for repairs and they desperately needed the parts to try to repair the broken drives."

Core's future plans include releasing its drives for machines made by AT&T. Hewlett-Packard, Compaq, and others. Prewitt also expects to announce a halfheight 40- or 50-megabyte, 26-millisecond drive. And he told PC Magazine "not to be surprised" to see a high-performance Core controller with an interleaf factor of 1, which would speed up the operation of any hard disk. He had planned and announced a Core-labeled AT called the Atomizer but put its production on hold "due to conditions in the marketplace." However, Prewitt may eventually go ahead and release it later this year. He has his hands full cranking out replacements for aggrieved AT hard disk crash victims. Or, as he likes to put it, "We've become the IBM of the disk drive market."-Paul Somerson

he problem with the controller card was a manufacturing defect. On the IBM AT hard disk. initially we had a lot of problems. Now they are going away. although the AT disks seem to be a little more fragile than normal hard disks. 99

cloud in the background."

Joe Jaworski, president of Peripheral Concepts, an Irvine, California, independent market-research firm, says the AT problems were traced to some circuit design systems in the controller board that resulted in data separation, alone with a faulty TI gate array. 'There were no specific technical

problems with the ICMII disk that I know of," says Jaworski. "It was just responding to erroneous signals."

But, Jaworski says, "when a compa-ny does one level of business and a customer comes along and increases its order by 100 percent or more, there will be problems." When problems developed, IBM gave CMI "a ton of money" to clean up quality control and improve efficiencies

This market is really dynamic," he says. "There have been worse screwups by other companies that have survived. Or as Shearson Lehman Brothers said in an investment advisory, "We would be inclined to look at companies with more clearly defined futures.

Ed Marinaro, executive vice president of Western Digital, says his company "has never publicly acknowledged" that its products are in the IBM PC AT. Asked about the AT-compatible controller cards Western Digital manufactures, which anyone-IBM or an individualcould put in an AT, Marinaro says, "This class of product has been extremely reliable, with one of the lowest failure rates that we have ever seen, about .003 percent."

How did word get out that Western Digital supplies the controller for the AT? "People opened up the machine and recognized our chips, " Marinaro says.

"But we won't acknowledge being with any specific customer. We respect our customers' privacy and their security."

Both Western Digital and CMI have their names or initials on the circuit boards, chips, or drive casings for easy identification.

LOOK INSIDE BEFORE BUYING Consultant Dan Sanguinetti, president and CEO of PC Professionals in San Francisco, says he won't touch an AT with a CMI disk. He believes anyone buying an enhanced 20-megabyte AT from IBM should open it up and look inside, only accepting the machine if it has a drive from IBM or Seagate. (CMI only sold 20-megabyte drives to IBM; the 30-

megabyte drives are made in-house by IBM or by one other maker, not CMI.) Sanguinetti blames dealers for much of the AT confusion. When the problem first became apparent, he says, IBM sent dealers a controller-card

diagnostic program with instructions to contact all customers who bought ATs. Some dealers didn't bother, causing some AT owners to think they had a disk problem. "If people weren't serviced, it was the dealer's fault, not IBM's," Sanguinetti says.

Sanguinetti says IBM was quick to replace bad disks, "If it's an IBM-installed CMI, it gets replaced quickly. If it's a disk bought directly from CMI and installed by the user or dealer, then it takes

a month and a half.' Overall, Sanguinetti estimates a 35 percent failure rate for ATs with a CMI disk.

IBM: COOPERATIVE Bruce Grant, director of technical support for Microage computer stores, says IBM was cooperative in handling the disk problem. "The whole processing time was longer than we wanted, but in retrospect, we applaud IBM's handling. The company said we blew it and corrected the problems. Other than the hard disk, problems with the AT have been minimal.

"You can say that this kind of thing shouldn't happen because IBM is so big." says Grant. "But I can see the other side of the coin. With any other manufacturer, this would be normal operating procedure. It was a royal hassle at the time, but IBM made good. Not every company is like Hewlett-Packard, with a zero failure rate.'

Grant calls the AT problems a textbook case of demand pulling down production. There was such a market for the AT that the quality-control mechanism broke down. "For a smaller vendor. something like this is routine. With IBM, it turned into a crisis of major proportions," he says, "If you or I have a bad day, it's no big deal. If IBM has one, it's a shot heard round the world."

A technical executive for a company that supplies components to IBM says buyers of non-IBM AT-compatibles, especially bargain units from the Far East or those sold through mail order, may be-

helieve that the CMI drives are one of the biggest frauds ever perpetrated on the American public. 99

a distributor

gin to experience some of the AT's disk/ controller problems. The cause? Using components with marginal tolerances. "When these machines have some of the length of service in the field the AT has, you're going to see the same breakdowns, possibly worse," he says. As for the AT's problems, he says his company believed weaknesses in the CMI drive and Western Digital controller amplified each other—but that ultimately the failure was IBM's because customers buy an IBM machine regardless of where the components originate.

CMI drives swear by them, not at them.
Doug Sharpe, manager of technical
support for Qubié, notes that the drives
were built to IBM's exact specifications,
so it wasn't CMI's fault that the specs

The general design of the PCAT is one of very good.

John Hoover, nation—

al sales representative for PC Source, a mailorder house, sells the CMI drive as a straight AT update. They sell well, and the company offers a 1-year warranty. Hoover feels the AT's problem stems from a lack of disk compatibility with DOS 3.0. The drive itself works well; he blames the controller card.

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PCAT is one of very good, well-thought-out architecture. But if you're not a computer expert yourself, you have to depend on somebody for information. And unfortunately you can't get that from IBM these days. \$9

Richard Brown, president of Express Systems in Schaumburg, Illinois, who is involved in direct sales, calls the AT problems "Old news." Brown made arrangements with Control Data for what he called "gold-plated drives" to protect his customers.

Jim Stevenson, president of Strategic Planning Corp. in San Diego, says his AT had a bad file allocation table and that reformatting at a lower level solved the problem. (PC Magazine's experience has been that reformatting may only postpone the day of reckoning.)

GENERALLY RELIABLE Robert J. Rush, vice president of the New York City. Life Insurance Co. in New York City. Asys his company has 510 IBM personal computers, 163 of which are ATs. He calls the ATs generally reliable, although the company had some minor problems initially. Not including these sethers, Rush reports less than one service call the private for each machine. "We've had report the property of the private for each think the following the second through the private for each think the following the private for each think the private for each the private for each think the private for ea

Some mail-order suppliers who sell

"IBM DIDN'T FESS UP" Lynn Wilson, a programmer for Electronic Data
Systems in Albuquerque, bought tho
original AT and had what the describes as
"the classic hard-disk problem." He
says. "IBM didn't fess up that there was
a problem. When you're plagued with
his, you don't know if what's wrong
with your machine is the problem or
something else."

Wilson's machine also had a bad motherboard component. IBM wanted \$300 for the repair, Wilson, who has an M.S. in electrical engineering, instead took a wiring gate and made his own part. Such homebrewed solutions are not part of the average user's arsenal, and the question is, why should they be?

"No one would tell me anything. I had two choices: panic or wait around. This attitude bothered me more than having the hardware fail," Wilson says. "STILL A SAFE BET" Is IBM in trou-

ble over the AT? Perhaps, but only in the short term. Kip Myers, vice president of marketing for Plexus Computers of San Jose, California, says, "The average person is trying to cover his ass when making a purchase, and IBM is still a safe bet."

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BECAUSE TIME IS THE ULTIMATE BOTTOM LINE.

In past issues, PC Magazine has tested and reviewed ten AT alternatives, many of which outperform the AT. These summaries give you a quick review of your non-IBM options.

# Power Computing

# Alternatives to The IBMPCAT

f you want to get into the fast lane of personal computing, IBM's PC AT is no longer the only, or necessarily the best, way to get there. Foreign and domestic computer manufacturers, recognizing that the improved 80286 chip has ushered in new performance standards, are producing speedy, heavy-duty machines that meet or beat IBM PC AT specifications and capability, often at attractive prices.

Not every alternative to the AT is nocsensity an AT clone or compatible, but all offer 6 or 8-MHz clock speeds, fasterfram-XT processing speed, and plentan-XT processing speed, and plentan-XT processing speed, and plentanhar reviewed in the last year and a half. As one as manifectures continue to produce new high-performance methines, PC continues to the processing speed of the protein and benchmark their performance. Watch for more AT-alternative reviews in upcoming issues.

AT&T 6300 PLUS ("Computing Options for Power Users," PC Magazine, Volume 5 Number 4) Offering a high-resolution tilt-and-swivel monitor, a tiny

footprint, and a comfortable IBM-style keyboard with LED indicators, the AT&T 6300 PLUS shares the good looks and ergonomic consideration of its cousin, the AT&T PC 6300. But, with an 80286 microprocessor, it's packed with power.

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# IBM AT HARD DISK DIFFICULTIES AND ALTERNATIVES

Winn L. Rosch explains what's wrong with the CMI drive and suggests some alternatives.

of all the shortcomings of the IBM AT, only one is genuinely lethal to both your data and your mental health—the unbelievably fragile hard disk that IBM stuffed (and sometimes still stuffs) into its enhanced 20-megabyte PC AT

Made by Computer Memories Inc., the AT hard disk is an innovative design called "wedge servo" that gives the extremely fast access times normally earned with a servo'voice-coil mechanism (under 40 milliseconds) at a lower price, comparable to that of slower, chearer hand-stenoer-motor technology.

The primary problems with the CMI hard disk apparently are caused not by its innovative technology but by subsidiary design considerations. The CMI drives use an oxide-coated disk surface or medium, which is a lower-cost alternative to much tougher thin-film media that are fast becoming popular in other companies' high-performance hard-disk drives. The ready availability of oxide-coated platters helped CMI fulfill the overwhelming and unanticipated initial demand for the drives. However, because the oxide coatings of such disks are inherently soft, they are very susceptible to damage caused by head crashes.

NO PARKAND-LOCK The delicase nature of the soft-medium problem was nature of the soft-medium problem was aggravated by the lack of a park and-lock feetaner, which automatically retracted to the disk surface used for storing data of secures them while the power is off, with such mechanisms, an inadvertent jar of the mechanism will not cause the head to scrape across the data surface and damage it (assuming the machine is no looner numiner).

The result of these twin shortcomings left the standard IBM 20-megabyte drives extremely susceptible to damage from merely bumping the machine, Furthermore, because the heads in these disk drives often landed on parts of the disk surface where important data might be stored, jarring the drive or moving the host computer-even when it was turned off-can and all too often does damage files stored on the disk. Worse yet, as John Dickinson recounts in his introductory article, "Courting Disaster: The IBM PC AT," this damage does not show up immediately after it originally takes place but might become apparent only weeks or months later, when you attempt to access the damaged file(s). Should the damaged area of the disk extend into the file allocation table, the entire disk can be rendered unusable—and irreparable. The only safeguard at your disposal is to make numerous and frequent hard disk backups.

HARD DISK ALTERNATIVES Instead of fixing these problems, both IBM and CMI have denied them and have chosen instead to replace drives as they die, which does you little good when you lose a hard disk full of data. The best solution, then, is for AT users to look at the alternatives.

Fortunately, a number of companies now offer replacement add-in hard disks (as well as alternative drives to enhance entry-level ATs) that overcome the shortcomings inherent in the official IBM hard disk drives.

Among the first companies to recognize the AT hard disk problems was Core International, which collaborated with veteran hard disk maker Control Data to make a series of extremely robust drives with the park-and-lock feature built-in. (Core even claims to have coined the term park-and-lock.) Although the Core drives use the more sensitive oxide-coated media, their much sturdier, more expensive, and faster servo/voice-coil head-positioning mechanism has thus far proven itself resistant to head crashes. The company currently offers a full line of AT replacement drives with formatted capacities from 20 megabytes to about 60 megabytes, all now rated at a racy 26millisecond average access time. The drives with capacities over 32 megabytes are supplied with replacement ROM chips to help DOS and the AT deal with larger amounts of disk storage

The Systems Division of Priam Corp. also manufactures (and sells under its own name) a line of hard disks designed for installation in the AT. These drives, which use plated media and voice-coil

# PC AT Hard Disk Installation Made Easy It takes less than 15 minutes to install a hard disk.

Disk drive suppliers have been cashing in on just how easy enhancing an AT can be. Anyone with a screwdriver can add a hard disk to an AT in less than 15 minutes.

The process is amazingly quick and easy. Once you slip the cover off your computer, you simply have to remove the two screws from the retaining brackets at either side of the drive slot. The hard disk then sides into the slot on its guide rails. Before securing the drive, you connect the three cables and the ground wite to the rear of the drive (the connectors are keyed so that they cannot be improperly inserted). Screw everything back together, and you're done.—Winn L. Rosch technology, have proven themselves very quick and resistant to head crashes. The Priam line comprises three drives with capacities of 24, 42, and 60 megabytes (formatted), which are available through dealers.

MAIL-ORDER MUSCLE Several mail-order suppliers now sell hard disks under the original disk manufacturer's name; many of the more popular ones are made by Seagate. Seagate manufactures a whole line of products that includes both low- and high-performance drives. The higher-performance models feature both thin-film media and park-and-lock. Like the Core and Priam drives, the Seagate units can almost be treated like brick and can withstand substantially more abuse than the IBM original-equipment CMI drives. Some mail-order suppliers offer similar high-performance drives from manufacturers like Tandon and Rodime.

You might want to avoid one brand name when buying a replacement or enhancement for your AT. Some suppliers are offering exact replacement AT drives manufactured by CMI. While these drives have the de facto IBM sanction, they also come with the same worries that come with the original 20-megabyte

enhanced AT. When buying a disk drive from a mail-order supplier, remember that hard disk manufacturers usually will not support users. They deal only with distributors and companies that put their drives in other products. You will have to depend on the mail-order supplier for support, so make sure that you buy from one that is dependable and has a responsible service program or return policy.

THE HEAVYWEIGHT DRIVE A growing number of AT users are adding Iomega Corp.'s Bernoulli Box to their computers. The Box is a genuine heavyweight among personal computer disk drives because its bulk and technology yield almost complete indestructibility. You can literally pick up and shake a Bernoulli Box while it is operating and the disk will not suffer damage-or even miss a byte. The Bernoulli Box is also faster than most hard disks at reading and writing long files, and because it uses removable cartridges it can be used to back up itself or other disks and store them securely. Disadvantages include high cost, the need for an external chassis, a single source of supply, and, until recently, the inability to boot your system directly from it

The newer 30-megabyte enhanced AT uses robust, IBM-manufactured hard disks that are comparable to those offered by Core. Although these drives are essentially free from the problems inherent in the CMI 20-megabyte unit, some users have noted that they are quite noisy. Moreover, the newer ATs that host the 30-megabyte drives have a built-in speed limit of 6 MHz that the original AT lacks. Installing a drive from another supplier can avoid these problems and save several hundred dollars (or more) along the



Magazine Labs benchmark tests than did those of some of the other machines, AT&T enhanced the machine to speed up other disk functions. The 6300 PLUS blew right by the PC AT on the PC Magazine Labs compiler benchmark test and dBASE sort routine. And the 6300 PLUS offers one more plus; it's marketed and fully supported by a big company with an aggressive commitment to becoming a major force in the industry.

BASIC TIME BT/AT ("Computing Options for Power Users." PC Magazine. Volume 5 Number 4) A true AT compatible, the Basic Time BT/AT has a few thoughtful extras like built-in I/O ports, vet Basic Time keeps its price much lower than the PC AT's. The BT/AT was just slightly slower

than an AT in the PC Magazine Labs

CIRCLE 600 ON READER SERVICE CARD Core Plus-Series Hard Disk (many models) Core Inter 542 S.E. Fifth Ave. Delray Beach, FL 33444 (305) 276-3929 List Prices: \$1,595 to \$4,595 for models ranging from 20 to 72 megabytes (Note: Seagate hard disk drives are n available directly to end users.) CIRCLE 600 ON PENDER SERVICE CARE

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### ■ PC AT ALTERNATIVES

prime number calculation test, but the hard disk drive was faster. The machine performed almost identically to the AT in tests of practical applications. Differences you might not notice at first glance include three standard DB-25 connectors for its two serial ports and one parallel port. 256K-bit RAM chips instead of piggyback chins, and for machines produced since December 1985 a motherboard that can hold up to 2 megabytes of RAM. Basic Time manufactures its own multifunction card to give the BT/AT even more memory and I/O capability. The firm also offers a number of optional hard disk drives with capacities of up to 70 megabytes. The BT/AT is a high-quality AT candidate for the price- and power-conscious consumer.





COMPAQ DESNFRO 286: ("High-Petromance Alternatives to the PC AT." PC Magazine. Volume 4 Number 23) Known to fire its BN-Compaq has done IBM one better with its Compaq has done IBM one better with its Compaq has the power of the properties of the power steel both of the properties of the machine. The high-capacity 1.2-megabyte floopy drive can read and write to PC-standard 3060. byte drives just like the properties of the p

Those features are nice, but it's the Deskpro's consistently speedy performance that makes it such a strong seller. The 20-megabyte Control Data hard disk drive is more than a third faster in average track-to-track access than the AT's. The 80286 processor's 8-MHz clock speed is 33 percent faster than the AT's 6-MHz speed, although with the Compaq you have the option of switching to 6 MHz. Even the optional 10-megabyte minicartridge tape backup drive is fast.

COMPAQ PORTABLE 286 ("Higher Performance Albemaries to the FC AT." FC Magazine, Volume 4 Number 23) The 3D-pound Compagn Pertaile 286 is a luggable, high-performance alternative to the AT does, but it rated 30 to 65 percent faster and the AT in FC Labs benchmark tests. This result is partly because it trust at fastre clock speed—3 MHz. However, the red only half as fast as the AT's highperformance drive.

The Portable 286's case and green of the Portable 286's case and green of the familiar Compaq Plus, but this machine has a half-height floppy and half-height tape backup drive where the single floppy once resided. An LED on the flopy drive flashers end or green depending on whether it's reading a 360K disk (red) or 1.2 megabyte disk (green). The Portable 286's aluminatum panels are mounted with





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### ■ PC AT ALTERNATIVES

high-torque, star-headed bolts that make access inside awkward and difficult. But if you need portable AT power, consider the Compaq Portable 286.

HEWLETT-PACKARD VECTRA
("Computing Options for Power Users,"
PC Magaztine, Volume S Number 4) Highly IBM compatible and somewhat expensive in a desirable configuration, the Hewlett-Packard Vectra features the distinctive
HP engineering touch—a well laid out,
neatly routed, and very sturty machine.

The system box is 30 percent smaller than the AT's, but there is room for up to three half-height internal drives and seven expansion slots. A push-button on/off switch is provided, but the security keylock is optional. The two 16-bit slots will be used by the disk controller and video card. The Vectra uses an 8-MHz 80286

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chip and has a socket for an 80287 corprocessor. The motherboard can hold 640k bytes of RAM; additional memorycards can increase the total to 36 days page bytes. The PC Labs benchmark tests rated the machine relatively slow in hard access times, but on CPU-intensive applications, the Vectar performed well. In an attempt to make the computer easier to use, the Vectar comes with PAM (Person al Applications Manager), a menufunction-bey-driven bell around DOS.

ITTXTRA XP ("High-Performance Alternatives to the PC AT," PC Magazine, Volume 4 Number 23) Without an AT expansion slot, 1.2-megabyte floppy drive, or hard disk lock, the ITTxtra XP cannot be considered an AT-compatible. Yet this worthy IBM PC-XT-compatible computer is less expensive and 30 percent faster than an AT.

The 80286 microprocessor runs at the AT speed of 6 MHz but can easily be downshifted to the PC's 4.88 MHz. The serial and parallel connectors are the same familiar DB-25s that the PC uses, so there's no hassle with special AT cables and adapters.

The ITI stra. NP uses eache memory management, a mainframe technique, to increase its operational speed. This technique makes the ITI'S floppy drive almost as fast as the AT's hard disk in some instances. In the PCL also benther tests, the ITI's TRY P matched AT processor speed and whize 2d by its comparisons, cache utility programs can, however, have an, however have protected disks.



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### ■ PC AT ALTERNATIVES

KAYPRO 286i ("High-Performance Alternatives to the PC AT." PC Magazine. Volume 4 Number 23) Although it doesn't much resemble the AT, with its dark green color and distinctive styling, the Kaypro 286i is a pure AT-compatible. Since the machine runs PC-DOS 3.x without any trouble, it should have no problem running PC software or AT-compatible expansion boards. You shouldn't need a 640K-byte. memory expansion board-the 286i comes with 512K bytes of RAM, but you can put two 64K-bit chip sockets on the system board. Although the 286i monitor's background is not as black as IBM's or its colors as vibrant, it's still an IBMcompatible display.

The keyboard is mushy; the manual is skimpy, but these are minor defects. The Kaypro 286i scored nearly the same as the AT in the PCL abs benchmark tests involv-

PC's Limited AT
PC's Limited A

ing memory and floppy disk access. However, its hard disk performance rated almost 30 percent better than the AT's. Real-life applications may not be quite that fast, perhaps about 10 percent better.

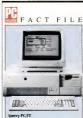
PC'S LIMITED AT ("Computing Options for Power Users," PC Magazine, Volume 5 Number 4) The PC's Limited AT is faster, more flexible, and two-thirds the price of the AT it emulates.

The PC's Limited AT's Faraday Electronics ATease system board, based on the Intel 80286 microprocessor, has a socket for an optional 80287 coprocessor and handles either 64K-bit or 256K-bit RAM chips for up to a grand total of 1,024K bytes of RAM. Its ROM chips can be altered for industrial applications that need specially designed ROM-resident routines. The board's configuration is set by moving awkwardly placed jumpers instead of DIP switches. The jumpers let you select the kind of keyboard you'd like-PC style or the newer AT style. Jumpers also configure serial ports to function as either AT 9-pin or PC 25-pin standards and the other ports to follow RS-232 or RS-422 communications standards. The PC's Limited AT comes with a single Mitsubishi 1.2-megabyte half-height floppy drive. There's enough room for both an additional half-height floppy and two full-height hard disk drives.

SPERRY POIT: "Computing Options for power Users," PC Magazine, Volume 5 Number 4) Aimed at the power user, the Sperry POIT features a higher processing speed than the AT, double its memory-expansion capabilities, and double its mass-storage capacity. If you're looking at multi-user systems, this heavy-duty machine can accommodate up to eight memore work stations under XFDMX System V.

On PC Labs benchmark tests, the PC/IT gave a solid performance. Its hard disk access time was one of the fastest, and its index score on the Norton Syslafo test, 8.4, was one of the best. However, the machine was one of the slowest on the prime number test.

The 80286 chip runs at 8 MHz, but it can be set to run at 6 or 7.16 if necessary. The standard 512K bytes of RAM can be doubled on the system board, saving some



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60-Mbyte tape backup drive

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of the eight expansion slots. A 1.2-megabyte high-density floppy disk drive is standard, the system can handle three additional storage options, and so you can mix and match a 36tK floppy, a 6th-megabyte cantridge tape hexkurphire, and a 44.6-megabyte hard disk. It can support two hard disk drivers, pushing maximum internal storage over 90 megabytes. Sperty offers three Key Tronic keyboands for the POIT: the Standard, the Professional, and the Advanced. The company also offers three values of the standard standard standard standard to the standard standard standard standard to the standard standard standard standard standard to the standard standard

TEXAS INSTRUMENTS BUSINESS PRO ("Computing Options for Power

it Users," PC Magazine, Volume 5 Number
4) Texas Instruments designed the Business Pro as a heavy-duty but flexible ATcompatible with enough room for six inter-

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## PC AT ALTERNATIVES

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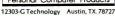
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# TWO



# **NEW ALTERNATIVES**

IBM's would-be competitors keep churning out new AT-like, highperformance machines. When NCR's PC8 and TeleVideo's AT Model II emerged from PC Magazine Labs, one looked worthy, the other merely overpriced.

# TO THE PC AT

# TELEVIDEO AT MODEL II

The TeleVideo AT Model II is a machine that many prospective purchasers may overlook as they wade into the murky AT-alternative marketplace. Perhaps that is just as well. Though it outperforms the IBM PC AT on many PC Magazine Labs benchmark tests, the quality of its construction doesn't inspire much confidence in its hardiness.

Neither its Rodime 20-megabyte hard disk nor its Toshiba quad-density floppy drive came through the testing without exhibiting at least some problems. Indeed, partway through the first day's testing, the Toshiba floppy drive's door handle came off in my hand, halting all testing until another drive could be shipped in from the manufacturer.

Like NCR. TeleVideo made its initial entry into the PC-compatible market with a machine that departed radically in appearance from the IBM PC. An all-in-one unite the original TeleVideo PC featured such innovations as a built-in titling monitor and vertically stacked floppy drives. It all added up to a striking design with a high-tech casebteic appeal and a small flootprint.

In designing its AT compatible, Televideo, like NCR, has renounced its maverick ways and meeltly followed IBM's lead. Aside from its slick monochomomonitor, there isn't much to differentiate this system from any other 8-MHz ATcompatible machine on the market, and few improvements have been made to justify the Televiko's relatively high price.

DOUBLE-SCANNING The monitor is, in fact, the most remarkable part of the system. Using TeleVideo's own display technology, it can produce resolutions of 640



by 400 pixels by double-scanning each line (that is, each horizontal line is displayed twice on the screen). The image is crisp, sharp, and easy on the eyes. The 16-bit monochrome adapter card supplied with the monitor is capable of rendering color displays in various shades of green with remarkable clarity, and for good reason. If you prefer color, you'll need to look to out-

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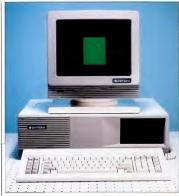
Pitted against the TeleVideo AT Model II, the NCR PCB energed at clear winner. Though the TeleVideo AT, because of its faster clock rate, ran through many PC Magazine Labs benchmark tests faster than the NCR PCB or the IBM PC AT, the overall quality of its construction left much to be desired. The NCR PCB, on the other hand, can be expected to last long after many similar alternatives have began to fall apart.

Both machines carry high price tags: the NCR PCB, however, can justify its cost in terms of engineering. In a market where computer manufacturers often take shortcuts to lower production costs (if not the list price). NCR has avoided skimping and compromising with its machine.

side manufacturers for color/graphics adapters and monitors. TeleVideo doesn't offer color as an option.

The monochroine monitor does not require a separate AC power line, which may help you keep the cable octopus at the back of your systems, until under control. The same heavily shielded cable that connects the unit to the adapter card's nine-pin port also draws power. A tilt and-swivel podestal is built into the unit for convenient positioning.

The Model II configuration normally features a 45-megabyte Seagate bard disk; our test unit, however, was fitted with only the 20-megabyte optional hard disk made by Rodime. On the CORE International benchmark test, this drive failed to meet



The TeleVideo AT Model II uses TeleVideo's own display technology to produce 640 by 400 pixel monochrome resolution. The machine features eight expansion slots (right).

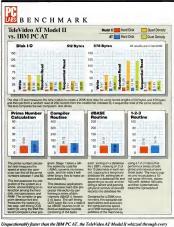
IBM's specifications for the PC AT. In use, it was apparent that 8-MHz operation was pushing this drive to its limits. So, although the performance charts show the TeleVideo's 20-megabyte drive outperforming the AT in disk accessing tasks. I have doubts about the drive's long-term durability.

Tele Video reps claim that the 45 megabyte primary hard disk normally found in the Model II features a 1:1 interleave ratio (that is, one sector is read in each revolution of the disk, as opposed to BM's three revolutions per sector), which should produce remarkable drive access times. If so, why support such a primary unit with such a medicore drive as the Rodfime?



FEW AMENITES Despite the TeleVideo AT's relatively high retail price, its systems until tacks many of the amenatics taken for granted in many other AT-alternample, is sere any way locacion the systems unit enclosure to the chassis a feature commonly offered in machines conting far less. Though the Rodines hard disk has a off-LED in indicate when the drive is ac-

### ■ TWO PC AT ALTERNATIVES



benchmark test routine like a champ. Even disk I/O times-a weakness of many an otherwisesuperior machine-show careful coordination of hardware to 8-MHz operations.

tive, there is no corresponding opening on the TeleVideo's gray plastic front panel to let you see this light. That flimsy plastic front is atypical of AT-compatibles in this price class; though I did not test the unit for radio emissions, it is clearly far less shielded than most

In a market offering highly regarded AT options at very reasonable prices, as well as machines in the above-\$4,000 range that feature useful enhancements and construction surpassing IBM's offering, the TeleVideo AT lacks a niche. De-

spite its fast clock and good benchmark performance, this machine may suffer more technical problems in the long run than one has a right to expect.

# NCR PC8

NCR Corp. has decided to play ball by the same rules as everyone else. Made in West Germany by NCR's European counterpart, the new NCR PC8 is a far cry from the distinctively different NCR Personal Computer Model 4 that PC Magazine reviewed in the December 11, 1984, issue (see "Not a Cash Register," Volume 3 Number 24, page 146).

The PC Model 4, with its high-tech styling, sought to distinguish itself as a PCcompatible that didn't look like one. The new PC8 is yet another AT lookalike, albeit one created with considerable craftsmanship and attention to detail throughout its construction, while maintaining a conservative outward appearance.

NCR has not committed the PC8's rather large systems unit to either a flat-on-thedesk or vertical tower orientation. Though the NCR logo is affixed sideways, so that it reads correctly in a vertical configuration. the box includes oversized felt feet to stick on the bottom of the unit should you want it to take up most of your desk space.

In the horizontal position, the big feet are necessary: If they are not in place you can't open the unit's key compartment, a neatly concealed door on the front panel that flips down to reveal the key slot and two LED indicators. This hidden door also provides access to the PC8's third halfheight drive slot, in which you can mount a backup cartridge drive internally without sacrificing one of the two regular floppy drive slots



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(408) 971-0255 List Price: Model I with 256K RAM, 1.2-Mhyte floppy disk drive, \$3,395; Model II (enhanced configuration) with 512K RAM.

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1.2-Mbyte floppy disk drive, 360K-byte floopy disk drive, 20-Mbyte hard disk drive, GWBASIC 3.1, DOS 3.1. Microprocessor: 80286

Clock Speed: 8 MHz Expansion Slots: 8

In Short: This expensive machine outpuces the PC AT because of its faster clock speed, but its lack of meaningful enhancements and overall construction quality stand up poorly to inspection.

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Despite the NCR PC8's unconventional styling, it works exactly like a standard IBM AT—only faster. The systems unit (right) uses an unusually neat, efficient design.

KEYS AND MORE KEYS The PCS's ultravide keyboard sports 30 individual function keys, 20 of whoth are aligned across the top of the board. Each of the function keys along the top (F1 through keys and the polymerton with the Shift or Crit keys—thus F20, for example, is the keys used in conjunction with the Shift or Crit keys—thus F20, for example, is the same as Shift-F10, and F30 equals Crit-F10. Single-key command sequences for any application of which macro processor and the NCR FCS are an intriguing. The exercial layout of the keys follows.

the IBM PC AT pattern almost exactly, with an added bonus—duplicate specialpurpose keys in abundance. Located between the alphanumeric and the numeric keypads is a duplicate set of cursor control



keys (allowing you to set the numeric keypad permanently for numbers-only use), and there are duplicate Ins, Del, PgUp, PgDn, Ctrl, Home, End, and Enter keys. The keys themselves are soundless, and

their feel is lighter than those on the IBM keyboard. Even so, you'll have no trouble getting used to it. Indeed, it makes the IBM AT keyboard seem limited.

The NCR's systems unit incorporates some of the slickest detail engineering I've ever seen inside a personal computer. The interior must have been designed by a neatness freak—there's a place for everything. Exact-ength ribbon cables are fisstificially folded and routed between the drives and the power supply, plastic clips hold connecting wires tightly to the chassis, and there are even special clips to hold the extra power supply and ribbon cable lines for add-on drives.

The PC8 uses an Intel 80286 operating at 8 MHz, and its performance in those operations testing CPU performance without disk I/O surpassed that of the IBM PC. Unfortunately, neither the hard disk Coulit by Control Data Corp.) nor the TEAC quad-density floppy drive took advantage of the faster clock rate in PC Labs' disk-accessing benchmark tests.

The CORE hard disk test results were specially surprising since this drive undeniably exceeds IBM specs for the AT. The most likely explanation for this anomaly must lie in the NCR's BIOS drivers; unlike IBM's BIOS drivers; which have been carefully optimized for the drives IBM's BIOS drivers, which have been carefully optimized for the drives IBM to the hardware. A machine with the capability of processing data so quickly internally should not be hardicapped by slow disk-accessing routines.

The PC8 submitted for review was equipped with NCR's own color/graphics



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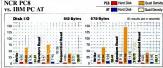


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Ouad Density

Designed for a 256K env-ronment, this spreadshee, applications test assesses the computational speed and RAM management ca publities of the machine by The NCR PC8 dramatically outperformed the IBM PC AT in every test using actual applications to simulate real-world computer use. The disk I/O routines, however, revealed that the PC8's drives

adapter and 14-inch, high-resolution monitor, which add another \$1,260 to the system's cost. The monitor displays characters composed of single dots, which makes the character set crisp and sharp. Your eyes will appreciate the sharper character definition, though whether it justifies the added cost is between you and your wallet.

gration of the system as a whole, concentrating on in teraction among the hard

two-step, self-timing DOS batch file using the IBM Pr

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Unfortunately, the monitor is housed in a clumsy, oversized pyramid. Apparently, this monitor was intended to be used with a separate pedestal of some kind; none, however, was provided with the machine reviewed. For comfortable viewing I had to perch the monitor on a shelf a foot above the system unit, where its angle of inclination caused the supposedly glareproof screen to reflect the ceiling lights. Don't consider buying this monitor without a tiltand-swivel stand.

If the IBM PC AT is the Cadillac of PCs, then the NCR PC8 is the Mercedes. Its performance outpaces the AT's and its overall construction quality is superb. In many ways, the NCR PC8 makes the AT seem almost crude by comparison.

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# OKIDATA MAKESGOOD: THE MICROLINI

# THE MICROLINE PRINTER SERIES

Favorites with many PC users, Okidata's Microline series printers received less-than-enthusiastic notices in last fall's comprehensive

printer issue. Okidata took our criticisms to heart and overhauled

its machines-and earned itself a second look.

he secret to keeping up in this industry is don't eat, don't sleep, don't even blink. Only a little more than half a year has passed since PC Magazine's most recent printer issue (Volume 4 Number 19), and it's time for an update—at least for the popular Okkdata Microline series.

This mini Project Printer Report follows the same format as PC Magazine's full-scale printer projects, right down to the printer guide table. Consider it a supplement to the 1985 printer issue.

How did this project come about? The six of Okldata Microline printers reviewed here fared rather poorly last fall—much to PC Magazine\*. Adaptive that the printers have all been improved since then, substantially enough to warnat another look. When Okldata informed special-projects editor and printer expert John Dickinson of the product enhancements, he reacted with great enthusisam and scheduled this secial reports.

When Okidata introduced its new 180 series and 190 series Microline printers, some of the stiffest competition the company faced was its own reputation. The old Microlines—the 82 and 92—were short on beauty, but they had the feel of a brick, which inspired a justified confidence in their reliability.

The new Microline printers reviewed in the 1985 printer issue were much prettier, but compared to the old standbys they seemed to be well, "delicate" would be the charitable way to put it.

Okidata supplied six printers for testing: two 182s, two 192s, and two 193s. Each model comes in two flavors—a standard Oki version and an IBM graphics-compatible version.

When PC Magazine Labs put these units to the test, they came up wanting. Contributing editor Charles Petzold wrote of the 193: "The two top covers, one for the front and one for the tractor feed, fall off easily, and the tractor feed is so filmsy it twists like a . . . snake."

Nor was that just one reviewer's reaction.
Robin Raskin, in her review of the IBM version of the 192, noted that "the light plastic cover falls off... at the touch of a fingertip, and the pin feeders are barely strong enough to keep the paper from being mangled."

Vincent Puglia reported that the access cover on his 182, "blew off the top and sailed 6 or more inches into the air."

aphs Les Mersille

And reviewer Jim Forney reported that the acoustic cover of the 193 fit poorly, the print quality was inferior to the 92, and the tractor assembly was "cheap, flimsy, and ill-fitting." Forney, a longtime Microline 29 cowner, concluded, "I'm still gald I own an Oki... but I'm glad it's not a Microline 193."

The most forgiving review was my own, which pointed out that "the Microline 182 is an economy model, providing little beyond basic printing."

These negative findings left many of us at PC Magazine as disappointed as the people at Okidata must have been. Most of us have fond feelings toward Okidata printers, and some of us admit to being emotionally attached to our Okis.

To best judge how much the printers had been improved, PC Magazine had each of the updated Microlline models tested by the same reviewer who passed judgment on the original. And so five reviewers gathered at PC Labs to test the six printers, and we ran the new Microllines through the standard PC Labs' printer lests.

By the end of a morning's testing, most of us were mildly elated. The improved Microline printers didn't look any different from their immediate predecessors, but they certainly acted differently: Access covers stayed in place, paper fed without jamming, print quality looked better, and the machines generally behaved the way they should have in the first place.

To some of us, at least, the printers didn't look so flimsy; they'd moved up to the realm of "attractively designed." But where, we asked ourselves, did the true differences lie?

OKIDATA EXPLAINS

Okidata product manager Gary Bailer

differences between the original Microines and the current versions are subtle,
included the substitution of the substitution of the

adding a guide for the paper and by reduce

de size of the pins and increase the

distance between the center of the pins and the

odge of the pin feed housing. Okidata fixed

the bail arm so that in no konger pops out.

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According to Bailer, all these fires are included in all printers being shipped as of this writing. What's more, all the changes the series of the series of

#### Some of us admit to being emotionally attached to our Okidata

printers.

Okidata is also sending out field change orders on such major problems, which means that even if you don't complain, your printer will automatically be upgraded the next time you bring it in to an authorized Okidata service center.

One fix that had not been added in time for PC Labs testing is a paper guide for the narrow column printers to keep the output paper from feeding back through the input slot. As several reviewers noted, this is the one remaining problem in the paper-feed mechanism. As of this writing, Okidata is testing a new paper guide to solve this problem. When it becomes available, a re-troft will be offered free of changle.

Some changes have been implemented along with the fixes. Probably the most no-table change is that Okldata is now making its standard printer IBM-graphics-compatible. The lots of the clude a PROM (Programmable Read Only Memory), a new manual, a warranty card, and the appropriate label for the printer. For the Microline 192 and 193, the IBM-graphics-compatible kills include Only of the printer. For the Microline 192 and 193, the IBM-graphics-compatible kills include Only of the Control of the Cont

The price of the conversion kit has not been set as of this writing, but Okidata expects it to be about \$100. As several reviewers note, Okidata recommends that users go to authorized service centers to have the new PROM installed. The cost of installation may range from no charge to about \$20. The kits themselves will be available only through the Okidata Logistics Group. (For further information call (800) OKIDATA.)

Another relevantly change is the addition of a near-left-quality (NLQ) mode to the 182 models. This feature will be strong and by the time you read this. For strong dard by the time you read this. For 6x24 95. This consists of one PROM chip, installation instructions, and documentation, and is available from Oklata directly or from Coklata delaws. Be aware that there are various of the printer and one for the IBM-graphics compatible version.

TOUGH AND LUGGABLE In terms of appearance and durability, Bailer points out that the new Microlines follow a totally new design to fit into "the modern office environment." They are meant to be quasiportable—a printer to take along with your Compaq on a business trip.

In particular, the new printhead technology in the new Microlines is lighter and, according to Bailer, more durable than the older technology of the Microline 82 or 92. In Okidata's Iragility tests, it took greater force to produce damage to this printer than to its predecessor. The mechanism is mounted in such a way that the mountings and the fragile-looking plastic cabine at as shock absorbers.

While discussing the printer's ruggedness, Bailer picked up one corner of a working Microline and dropped it about 6 inches without any noticeable effect. Reviewer Petzold was so intrigued by this that he decided to try his own drop test (see sidebar entitled "The Drop Test"). Petzold's test showed that the printer is not indestructible, but that it can certainly take the wear and tear of an office environment.

the wear and tear of an othree environment. All told, the original perception of these printers as filmsy seems to have had more to do with ergonomic factors than with any serious problem in the mechanism itself. Now that the access cover, paper feed, and other problems have been fixed, the Microline 180 series and 190 series printers look a lot more attractive. Okidata has earned this second chance.—M. David Stope

#### MICROLINE 182 (IBM Version)

I summed up my review of the original Okidata Microline 182 (IBM Version) by saying that I would not trade in my old Epson MX-80 with Graftrax for it. Now I would. Not only is the new Microline sturdier than the first version I tested, but it offers some new features as well. The 182 is not the quintessential printer-it still has faults and it still looks less sturdy than the old Okidata printers-but it has become a serious contender.

The Microline 182 offers a nearly complete array of print enhancements. Whether you want draft-quality print for your personal reminders or a highly legible near-letter-quality font for your business letters, you can find it in the 182. Other print enhancements include emphasized. enhanced, and underlined print. The PC Magazine Labs speed tests rated the draft print at a little over 80 characters per second, the emphasized print at almost 57 cps, and the near-letter-quality font at just under 34 cps.

In addition to print enhancements, the Microline 182 provides page-format commands, horizontal and vertical tabs, and a variety of character sizes from condensed to double-width. It can also print IBMcompatible graphics.

When I powered up the unit and fed a few form feeds, the lid remained where it belonged. Okidata has now incorporated a plastic pin system that locks the lid into place, rather than leaving it to hover above the unit. While this cut down many of the problems I had with the earlier version, the printer still occasionally imitated a Hoover vacuum cleaner by sucking outgoing paper back into the paper feed slot. Presumably,

#### All of Okidata's

Microline upgrades can be retrofitted to earlier

models.

the addition of a paper separator will remedy this problem.

Because of the unit's lightweight appearance, I went beyond the normal PC Magazine Labs tests and attempted to test the Microline 182's ruggedness. I lifted the unit as it was printing and began swaying it side to side. As it continued to print. I increased the angle of each upswing until I had the 182 doing a loop-the-loop. Finally, I held it upside down and shook it-not too

Not only did the printer continue print-



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Microline 182 (IBM Version) Okidata 532 Fellowship Rd. Mount Laurel, NJ 08054 (WOOLOKI-DATA (609) 235-2600 (in N.J.) List Price: Parallel version, \$299; serial version, \$359; olus \$79 for 192K board Dim.: 3.2 × 14.6 × 10.9 Weight: 9.9 lbs. Country: Japa In Short: With its earlier



ems fixed, the Okidata Microline 182 (IBM Version) will withstand a reasonable amount of abuse. It offers draft quality

print at 80 cps, near-letter-quality print at 34 cps, and IBM graphics compatibility. PICLE 600 ON READER SERVICE CAR



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#### OKIDATA

ing, but the output was as high in quality as in the official test run. I do not believe many printers would pass this test—and not just because most of them are too heavy to lift. Appearances saide. Okidata has incorporated a new technology that allows the printhead to withstand a fair amount of abuse.

The Okidata Microline 182 has been overhauled since its introduction. No one can reasonably argue that the unit shares the Sherman tank appearance of its predecessor, the Okidata Microline 82. However, in this case at least, appearance is deciving. The Microline 182 is at least as rugged as the old 82, and in some ways more so—Vincent Puglia

#### MICROLINE 182 (Standard Version)

I've tested an Okidata Microline printer three times now. The first for PC Magazine's 1985 project printer issue. My reaction then to the standard version of the Microline 182 would best be summed up as: "It's not a great printer, but what do you expect for \$299?"

The second test was for PC Labs' focus on sheet feeders (see "Sheet Feeders: One Page at a Time," PC Magazine, Volume 4. Number 24.). The Okidata CSF 900 was one of the sheet feeders on the lists, and 1 tested it on the Okidata Mciroline 192 (Standard Version). (The 182 does not accept the sheet feeder). JM ye onclusion then was that the CSF 900 fared better as a sheet feeder than the p2 fared as a printer.

Well, the third time was charmed; the Microline 182—and indeed the entire Microline series—has caught up to the CSF sheet feeder in quality and value. The new version of the Microline 182 is

slightly slower than the original. The PC Labs speed test clocked the printer at 80.3 cps as opposed to 82.2 cps for the first model. However, it isn't clear from the test results whether this 2-cps difference reflects a change in printer design or whether it is simply a matter of individual variations among printers.

Like the original Microline 182 offered, the new unit's print features include

# PRINTER GUIDE

#### The Key to the Printer Guide

#### PRINTING FEATURES

- H Horizontal emphasis (bold)
  V Vertical emphasis (double
- C Correspondence quality
- U Underline
- S Sub-superscript
- R Red ribbon

#### FORMATTING FEATURES

- P Proportional spacing
- J Justified lines C Centered lines
- LH Variable line heights
- FL Variable torm tength
- HT Horizontal tabs

#### SOUND LEVEL



The blue bar shows the rated DBA. The orange bar shows the measured DBA. The rule is the average tor all printers, 72.

ne e

#### COMPATIBILITY

IBM PC Compatibility

Migh order characte

Low order char.

\_\_\_\_

Graphics Compatibility

PC-DDS Graphics Comm

S Vendor Software

No graphics

IBM Command Sequence Compatibility

Sequence Compatibility

IBM Matrix/Graphics/Pro

Diable 630

Qume Sprint

Other

Pc. Magazine's Frinter Guide, wheels, appeared in Volume 8 Aumber 10, appeared in Volume 8 Aumber 10, appeared in Volume 8 Aumber 10, appeared in the printer of your dreams. The table on the facing page provides essentially the same minormation for the updated versions of the Uniformation for the updated versions of the updated versions of

To make the best choice, first decide how you'll be using it for. That information will help you determine how fast you need it to print, how fancy is sprint quality must be (as well as how fast it needs to print in a high-quality print mode), how quiet it needs to be, and whether compatibility is a perinent issue.

While the prist samples in the Printer Guide show you what he printer's output looks like (blown up 40) percent), the list good each printer's printing and formating features tell you how far beyond "plain smalla" printing it will go. Emphasized prist and underlining, for example, are useful for almost any document because they allow you to boldface or underline your points or highlight your numbers. A printer with a variety of type pitches can print with a variety of type pitches can print printing form (page) lengths is useful in many applications.

many adjunctations. PC Magazine's Printer Guide also tells you about each printer's text and graphics compatibility with the IBM PC, which can be important for applications ranging from Guide also tells if your printer of chiece is compatible with a more popular printer line, such as Epson or Diable; if it is, that compatibility will almost guarantee seamless word processing or graphics support.

The Printer Guide is helpful when you make a printer-buying decision because it shows you a large amount of information in a very small space. But don't overlook the written reviews—it's there that you'll find those immeasurable qualities that can make all the difference in the world.

IDDEL		TYPE, CARRIAGE WIDTH, PRICE	SPEED: Characters per second	TYPE PITCHES: Characters per inch	PEATURES: Printing Formatting	SDUND LEVEL: Decibels	COMPATIBILITY IBM PC Graphics Other printers
Microline Qrn	182 (IBM)  Okidata Microl . Corresponden hanced print. ault. Correspo	Dot matrix Impact 10.0 \$299	120 rated 80.3 delaull 33.9 quality	5.0 10.0 6.0 12.0 8.5 17.1	HVCUS	58 78	0
Microline Qrn	182 (Std.) Okidata Microl fault. Corresp nting. Emphasi er On Default.	Dot matrix impact 10.0 \$299	120 rated 80.3 delault 34.2 quality	5.0 10.0 6.0 12.0 8.5 17.1	H V C U S	58 78	<b>○</b>
Microline Qm	Okidata 192: ce Quality. En ic Print. Unde spondence Qual	Dot matrix impact 10.0 \$499	160 rated 96.0 delault 35.0 quality	5.0 10.0 6.0 12.0 8.5 17.1	H V C U S	58 80	90
Microline G! [11	192 (S(d.) Okidata 192 St respondence. I Power On Defau mphasized. Enh	Dol matrix impact 10.0 \$499	160 raled 96.0 delault 35.0 quality	5.0 10.0 6.0 12.0 8.5 17.1	H V C U S	58 76	<b>♥</b>
Microline G!rn	Okidata Microl 1t. Correspond alics. Power O anced. Emphasi	Dot matrix impact 16.0 \$699	160 rated 96.0 delault 34.0 quality	5.0 10.0 6.0 12.0 8.5 17.1	H V C U S	55 78	<b>P</b>
Microline	193 (Std.) Oki 193 Standa ondence Qualit Emphasized. It rrespondence Q	Dol matrix impact 16.0 \$699	160 rated 95.9 detault 34.9 quality	5.0 10.0 6.0 12.0 8.5 17.1	H V C U S	55 73	<b>⊗</b>

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10 and 12 characters per inch (cpi), condensed and enlarged print, vertical and horizontal emphasis, superscripts and subscripts, and underlining.

A welcome addition is a near-letterquality mode, which was notable for its absence during the last set of tests. The NLQ mode is honestly named, and its 34-cps speed compares favorably with the competition in this price range.

usual in this prace range. The standard version of the printer still lacks computibility with left left printer set, but Okidate now selfs office the character set is the change of one ROM chip. Okidata recommends that use not PO (kidata and undergrad service centers take care of the change, but the chip swifter sale rounting around the innards of their machines.

One or two minor problems remain with the 182. In my review of the original version, I wrote, "The printer's enhanced print mode (vertical emphasis) merely off-sets the dost to give a squitggly, out-of-four effect." In has been improved, the out-of-fours effect is still high, though oberable thanks to its low print. But emphasis to the out-of-fours effect is still high, though oberable thanks to its low print. But emphasis printed as 2500, the Microlline 182 is a must-see for anyone on a low budget.

—M. David Stora

#### MICROLINE 192 (IBM Version)

When I first reviewed Okidata's Microline 192 (IBM Version), I compared the printer to the then-new Coca-Cola, lamenting that change was not always for the best. Unlike Coke, Okidata has not revived its classic design, but the company has fixed the 192 so that the mobilems are all but cone.

The new, improved 192 is still compact enough for the desktop computing set, but

the lightweight, streamlined design is no longer cheapened by flimsy parts. The original 192 included such features as an access cover that flew off the printer, pin feeds that couldn't hold a sheet of paper on course, and a less-than-functional paper bail. All of these problems are, blessedly, gone. Even the printhead mechanism has significantly less play.

The improved 192 is still plagued by some paper-feed problems, but they are far less dramatic, requiring only a little care after tearing off a sheet of paper. Because of the tear bar's placement deep beneath the access cover, the paper, once tom, can go in any direction it pleases, typically wrapping itself around the roller. According to Okidata, this last paper-feed problem should be eliminated by the introduction of a new paper guide this soring.

A reasonably priced optional sheet feeder adds extra value, letting this inexpensive dot matrix printer handle many demands of the office environment. The sheet feeder is easy to install, simple in design and low in cost

You can purchase the 192 with either the standard ROM or the IBM-compatible ROM, and a conversion kit is available for those who want to change. Thus the old Plug in Play flexibility is once again an option, but users can still buy factory-configured printers.

Instead of dreaded DIP switches, the Microline 192 sports an easy-to-use menu-



#### ■ Instead of the dreaded DIP switches, the Microline 192 sports a menu-select mode

select mode. You can change over 50 printer attributes by pressing front-panel buttons. These settings remain in nonvolatile memory. Anyone who's ever despaired over banks of poorly labeled DIP switches will appreciate this feature.

The IBM-compatible version of the 192 comes with Okifont software. This print font editor includes five downloadable character sets. To create a character, you draw on a grid. The software does the conversion and programming.

Other features on the 192 include a hefty 8K-byte buffer and a no-muss, long-life cartridge ribbon. The NLQ print is crisp and clean thanks to a 17 by 17 matrix. (Default quality uses 9 by 9.) While the 192 is not especially quiet (80 db on the PC Labs sound test), its noise is not irritating.

solial lexit, its fonce is not minuting.

The Misroille 192 has carried a place on the elsktop, It's both slim and light, and while it is not ruly portable it is certainly liggable. The reconstituted of the printhead, access cover, and pin feeds printhead, access cover, and pin feeds of the printhead of the pri

#### MICROLINE 192 (Standard Version)

Because I've always been fascinated by in yelectronic wonders, the Okidata Microline series of printers appealed to me the moment I first saw them during PC Magazine's 1985 printer survey. They certained the printer tests that my initial delight numed sour. If the hood of your Honda batebback or the cassette door of your Stoy Whatman behaved like the only our Stoy Whatman behaved like the otigen that same disappointment—very time you picked it you of the floor.

I'm happy to say that the new, improved Microline 192 stays in one piece

#### THE DROP TEST

By nature a gentle man, printer reviewer Charles Petzold was uncharacteristically excited by the opportunity to drop an Okidata printer on the floor.

Ann not by nature a destructive person. But when representatives from Oki-data suggested that the Microline series of printers could survive a 1-foot drop on the deak, the tempsation to perform such a set in the PC Magazirie Labs was more a set in the PC Magazirie Labs was more and review of the Okidata Microline 192. I was the reviewer who said that the princer's true home should be on display unsert part of the printer just did not seem suitable or printer just did not seem suitable and the printer just did not seem suitable and printer just did not seem suitable different printer just did not seem suitable and printer just did not

I wondered if my former opinion was a mistaken perception based on the size and seemingly fragile construction of the 192. Does the 192 actually incorporate solid craftsmanship where it counts? Could I really judge a printer by its access cover?

Finally, there was no way I could avoid it. After working up some courage (and informing special projects editor John Dickinson of my intention), 1 started up the speed test. lifted the printer 12 inches above the desk with both hands, and—don't try this one at home, kids let go.

The printer stopped running when it hit the desk, but started up again after I turned it off and on. It seemed to be working normally, although the print quality was a touch lighter than before the drop. Of course, such behavior is addictive, and I couldn't resist trying it again. The second time the printer kept on running but the print quality was much lighter-as if the ribbon had been used for several years. I replaced the ribbon with no improvement. I felt bad after that and didn't have the heart to try it a third time. Unlike some people, I have never felt the urge to smash up computer equipment.

Since PC Magazine prefers to return intact, working equipment to their manufacturers rather than boxes full of mutilated pieces, the Labs do not normally conduct drop-tests on peripherals. Dropping only the Okidata Microline 192 is, 1 admit, unfair, I really don't know how other printers would react to this brutal treat-

ment.

Seek up in the fourth-floor colitical coffices, I. couldn't find any Okidana 2410 coffices. It couldn't find any Okidana 2410 coffices. It couldn't find any Okidana 2410 coffice of the first find the first find the first find the desk and ending up clobbering an or-cilloscope (or project testing editor Minetal O'Cone) down in the third-floor PC Labs. Back at home, I looked at my DBM Graphics Printer and considered it. But Graphics Printer and considered it are with the first find the first first first first floor first first first floor in matter of Choice nather than necessary.

In my original review of the Okidata Microline 192, I said the print quality and speed were surprisingly good for a printer this small, and that is still true. The printer appears to be more solidly constructed than the original version. It can probably survive real-life environments

as well as most other printers. But just don't drop it, OK?

-Charles Petzold

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# 1986, 19 1989,

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# *87, 1988, 1990, 199*

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#### ■ OKIDATA MICROLINE PRINTERS

when printing, and that satisfies at least a minimum standard of printer operation. The troublesome access cover has been modified to include clips that make it she on. It's pretty obvious that this is a retrofit because you can shift the cover a half-inch toward the front of the printer. But the clips make the cover stay put, and it's a welcome improvement.

Aside from the inproved access covers, other more subtle changes now make the Microlines studier than the originate. The Microlines studier than the originate that the continuation of th

quality tont looks good.
The only problem I had with the new Microline 192 printer was a minor and with the problem 193 printer was a minor and earl fibon cable. Normally the cubic runs from the left side of the case. Iles flat on the bottom of the printer, and curst up to attach to the right side of the printhead. At one opoint, the cable busked up at the left probint, the cable busked up at the left mayin. I have never the way to the left margin. I have never some straightforward to the way to the left margin. I have never straightforward the problem and in never recurred.

If you have an IBM PC, you'll probably



want the IBM version of the 192. While both the standard and IBM versions of the Microline 192 print the high-order IBM character set, the IBM version supports a superset of the IBM Graphics Printer control sequences and, more important, can handle a screen-dump if the DOS GRAPHICS program is loaded.

You can download fonts into both versions of the printer, but only the IBM version comes with software to help you out. The basic difference between them is the ROM chip, and Okidata will sell you a kit to convert either model to the other. Last summer, the Okidata Microline 192 was just pretty. Now it's pretty, and it works too.—Charles Petzold

#### MICROLINE 193 (IBM Version)

The Okidata Microline 193 models are the wide-carriage versions of the Microline 192s. The 193s are the smallest wide-carriage printers to pass through PC Labs. The IBM-compatible version supports the IBM character set and IBM-compatible graphics and adds a few other control sequences for italic and correspondence.

quality.

The Microline 193 (1BM Version) comes with a box full of goodles including on a platen-cleaning kit. a tractor feed, and a disk with downloadable fonts. Like the 1992x, the 133 primers are fast and generally have good print quality. The undifferent control to the property of the grain stability when attached to the printer and it works well.

Another good feature of the Microline 193 is the manual. Okidata has picked up the tradition originated with the Epson FX-80 of supplying manuals that actually teach you something about printers. Using



lots of BASIC code, diagrams, and enlarged drawings of dot patterns, the Okidata 193 manual guides you through the control sequences. Although the manual loses steam when it comes to the sections on all-points-addressable graphics and downloadable fonts, you'll still find enough to get you going.

The IBM version of the 193 also comes with a font disk, so you can take advantage of the downloadable font feature without resorting to doing the programming your-

self. (For some people, this is a blessing, but for others, it takes all the fun out of it.) For those times when sending the con-

trol sequences to the printer is inconvenient, the 193 will let you control many of its features from the front panel. The nice thing about Okidata's implementation of this menu mode is that it's interactive: The 193 prints your selections as you choose

I had said in my original review that during graphics printing, the Microline

193 "wails as if in dire pain." Does it still? When I started up the graphics test, a visitor to the PC Labs was standing about 10 feet away. Without prompting from me, the commented, "Oh, that sounds painful," I accept the comment as confirmation of my original opinion.

The optional Okidata CSF 900 Cut Sheet Feeder can be used on both the standard-carriage Microlline 192 and the widecarriage Microlline 193. At first, this does not seem possible. The trick is that the

#### THE MICROLINE SHEET FEED OPTION

Back at the drawing board, Okidata also patched up serious differences between the Microline printers and their sheet feed attachments.

DC Magazine reviewed cut sheef feeders late last year (see "Sheef Feeders: One Page at a Time," PC Magazine, Volume 4 Number 24). Among those tested was the Okidata CSF 900 for the Microline 192 and 193 printers. At \$229, not only was it the most inexpensive sheef feeder that PC Magazine Labs tested, but one of the best.

Now that the Microline printers have been enhanced (and the already reliable CSF 900 has undergone some subtle but significant changes, too), the result is an even better printer system than the one evaluated in Volume 4 Number 24. Simply attaching the CSF 900 to a

arew Microline 192 immediately eliminated the access cover annoyance, the pin-feed paper feed problem, and most of the other flaws of the original 192.

In my first review of the CSF 900, the only time I ran into a problem was when the output hopper got full. At about 140 pages, the printer started complaining loudly and finally refused to feed paper. This didn't seem like much of a problem considering that Oblidate only claims a capacity of 120 sheets for the output bin.

Nonetheless, changes in the ČSF 900 have eliminated even this drawback. PC Magazine Labs tested four of the sheet feeders this time through—one with each 192 and 193. In two of the tests, the CSF 900 handled about 170 sheets of paper in both input and output bins with no problems. In a third test, only one paper jam occurred in a bin full of paper.

One reviewer had recurring jams and to be caused by the paper itself. A close look at the paper revealed that it was control to a part of the paper revealed that it was control part of the paper guide of the sheet feeder. When the purity revealed that it was control that paper so that the curl worked with the printer rather than against of the problem disappeared. But the problem could be avoided if the paper guide were designed to anticipate the problem suite the problem suits the suits the suits the suits the suits the suits t

This particular unit appeared to have a problem. Unlike the supposedly identical CSF 900s tested, it insisted on announcing itself with an annoying squeak that would not be appreciated in an office.

was that the CSF 900's best feature is its ease of installation and simplicity of use with the small-carriage 192s. But a significant complication crops up in installation with the wide-carriage 193s.

In order to work with the wider printer, the sheet feeder has an adjustable mounting bracket that needs to be taken apart and restructured to fit on the wider carriage. This is not an easy task, as reviewer Charles Petzold found out.

One point that all reviewers agreed on

"To adapt the CSF 900 for the Microline 193, you must remove three screws and reorient the mounting bracket," says Petzold. "Fortunately, you'll only have to do it once. Although two pages in the manual are devoted to this initial installation, they are not enough. I finally reassembled it more by instinct than by followine the instructions."

Once you've mastered the assembly, the sheet feeder and tractor feed can atach and detach from the printer very quickly. According to Okidata, this section of the documentation has already been rewritten to address the problem.

In my first look at the CSF 900, I concluded that the additional investment in the sheet feeder was well worth if for anyone who owned a Microline 192 or 193. I still stand by that conclusion, but if you have the 193, you might like to let your dealer set it up for you.



CSF Cut Sheet Feeder Okidata

532 Fellowship Rd. Mount Laurel, NJ 08054 (800) OKt-DATA (609) 235-2600 (in N.J.) List Price: \$229

In Short: One of the cheapest and best cut sheet feeders PC Magazine has tested. Its performance is further enhanced by the "fixes" in the Microline 192 and 193 printers.



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#### ■ OKIDATA MICROLINE PRINTERS

sheet feeder has to be partially taken apart and reconstructed to clamp onto the wide carriage. (The feeder is still limited to 8½inch wide paper, however.)

The Microline 193 and CSF 900 make a good versatile combination. The quick switch between them is quite painless, and you'll easily get the procedure down to a matter of seconds.—Charles Petzold

#### MICROLINE 193 (Standard Version)

After a bad case of growing pains, the new Microline 193 (Standard Version) has matured into a printer with a number of good new features. The annoyances that plagued the last version of the 193 have been eliminated

While still much lighter than earlier models, it is no longer a flimsy machine. The print quality is consistently clean and crisp, with the exception of the "half dot enhanced" mode, which was ragged.

Originally, the 193 was offered factoryconfigured for either Okidata's own protocols or with IBM graphics printer protocols. But the company offered no retrofit package comparable to the old Plug 'n' Play kit that let users add IBM graphics emulation to the non-IBM version. That limitation has now been corrected. One of the first things I did on the 193 was to look and see if the DIP switches were any easier to get at than on my old 92. Surprisingly, there aren't any. Oki has replaced the old hardware-selected functions with menu-selected software commands, which are retained in battery-backed-up memory until you change them or the bat-

tery needs replacement.

The optional tractor assembly can be installed in at least two ways, but if you don't do it correctly, the acoustic cover doesn't fit. This problem results from poorly written documentation, which Okidata says is being revised.

Okidata's new sheet feeder for the 192/193 printers, however, is impressive. Once set up the sheet feeder is easily attached and can be traded with the tractor in aminute or less. theld about 130 sheets of paper and fed them without a hitch. Alhough it won't feed envelopes or collate multiple-sheet documents, this accessory goes a long way toward bridging the gap between a small desktop printer and some of the bigger office machines.

Despite its lighter construction, the new 193 is a decent printer. As a longtime Oki owner, it's nice to be able to recommend one to my friends again.—Jim Forney

M. David Stone, Vincent Puglia, Robin Raskin, and Jim Forney are frequent contributors to PC Magazine. Charles Petzold is a contributing editor.



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# POWER PERFORMANCE: NINE PROGRAMMABLE MAIL-MERGERS

"programmable"
mail-mergers
bring database
management
techniques
to bear on
mass-mailing
tasks.
But no one
package
combines a
full range of
features

with ease of use.

These nine

If mail-merge programs could on no more than insert name dad no dadresses: and po boilerplate text into business from letters, pleny of office managers and other PC users would still consider them remarkable times aving tools. What many, perhaps most, users don't know is that many mail-megers offer far greater capabilities than these. They have layers of must be that many that when the control with the many mail-megers offer far greater capabilities than these. They have layers of must be that must not be noter even seen, much less take advantage of. The most sophisticated most are true power-user programs that will

take on a wide range of tedious operations.

Mail-merge programs often perform simple calculations, allowing you to prepare invoices or customized job estimates. Many pause at each new letter to accept input from the keyboard. Some can sort your mailing lists. Some can even test your data file for certain conditions, such as a certain ZIP code, and then insert customized text customized text.

These "conditional" commands in mailmerge programs actually qualify them as mini programming languages that offer you much of the power and many of the pitfalls normally associated with computer programming. On the plus side, you gain flexibility, including the means to automate complex merge operations for execution by less experienced personnel. The disadvantage is that for each merge run that you set up, you have to perform the traditional and time-consuming rituals of programming: planning, writing, and debugging. But if you need to squeeze real horsepower out of your mail-merge operations, prepare complex personalized mailings, or automate repetitious reports and can find your way around a simple script file, the programs reviewed in this article can help you get the job done.

Because mail-merge straddles an ill-defined border area between database management and word processing, these programs don't always fit a neat product category. Usually, they are features of word processing pro-





Because the mail-merge function inhabits the border zone where database management and word processing meet, it's not surprising that an integrated package, Perfect Writer/Perfect Filer, came out on top of our mail-merge tests and evaluations. This program is by far the easiest to use, a critical consideration. And if you use it with its spreadsheet partner Perfect Calc, which adds math capability, Perfect Writer/Perfect Filer is among the mast powerful as well. Honorable mention goes to WordPerfect, which scored well on mast of our tests and won high marks for its use of interactively defined macros to control the merge process. A second honorable mention goes to New-Word 3, which has most of the power of WordStar's classic MailMerge with the addition of math functions and number formatting.

grams-the case with eight of the nine programs reviewed here-but they can also be integrated with a database package that works closely with a word processor (like the Perfect Writer/Perfect Filer team included in this review roundup). In our survey, we looked for and evaluated the following features:

Help with data entry. Unlike a database management program, which usually prompts you for the data it expects, a mailmerge program often presents you with a blank screen and asks you to enter the data freestyle. If you inadvertently omit a piece of data or a comma, you can throw your whole merge run out of kilter. We looked for programs that have special data-entry

screens and that prompt for each item. Data formats. The most common data format is "comma-delimited ASCII " a straight ASCII file in which the data items are separated by commas. While creating such a file can be a tedious task, many database programs can export data in comma-delimited format; they speed data entry by letting you add a database program to

your mail-merge system

Translation utilities, If the mail-merger doesn't use comma-delimited ASCII files, does the program offer an easy way to translate data from other programs?

Omits leading or trailing blank spaces. Another way to make data entry a bit easier if you have to enter the data freestyle is to line up your data in a spreadsheetlike grid with all of the commas aligned. However, this method will only work if your mail-merger can throw out the leading or trailing blank spaces.

Sorting. Can the program sort your data file?

Closes gap when field is missing. If a data item is missing, such as a company name in an address, does the program leave a blank line where the missing field would normally be placed, or can it close the gap?

Input from the keyboard. Can the mail-merger pause to ask the operator for input, such as the current date or the price of an item? Print-to-screen option. Can you pre-

view the merge output on-screen before you send it to the printer? Spooling. Can you edit another docu-

ment while the merge run is printing? System date. Can the merge program

use the DOS date in the printed documents? Number formats. Can you specify decimal places or put dollar signs or com-

mas in numbers from the data file? Three-up or three-across labels. Can you print labels three in a row?

AND/OR operators. Can you create compound IF statements using AND and

OR operators? Merging boilerplate inside a paragraph. Can the program merge boilerplate into an existing paragraph, or does merged text always have to start a new paragraph?

Merging ASCII files. Do you want to include part of a 1-2-3 spreadsheet in your monthly budget report? If your mail-merge program can read in ASCII files, you can 'program' a merge run that will read the ASCII version of your spreadsheet and insert it into your report.

Widow and orphan control, It's important that your merge run doesn't end a paragraph at the top of a page or begin a paragraph at the bottom of a page. PC MAGAZINE . APRIL 29, 1986

Math operations. Can the mail-merger do math?

Command files. Can you automate a repeated merge so that the operator enters only the name of the master document and the name of the data file?

If your mail-merger includes these power features and you're not using them, the reviews and features tables that follow should give you a clue as to what you're missing. If your office doesn't even use a mail-merge program, read on about some of the most efficient timesaving programs around.

#### WORDSTAR PROFESSIONAL MAILMERGE

MicroPro International Corp.'s original MailMerge is the granddaddy of the merge program genre. Even today, the program packs quite a wallop, performing both simple and complex merge tasks with an agility that belies its age. Originally sold as a standalone program, MailMerge is now part of the WordStar Professional. Version 3.31, package, which includes Word-Star. MailMerge, CorrectStar (a spelling checker), and StarIndex.

MailMerge uses a simple device for merging data with text. At the heart of this device is the master document, which contains commands that control the Mail-



MicroPro International 33 San Pablo Ave San Rafael, CA 94903 (415) 499-1200 List Price: \$495

Requires: 192K RAM (128K without CorrectStar), two disk drives, DOS 1.1 or later. In Short: WordStar Professional's Mail-Merge is a dependable workhorse that handles basic mail-merge tasks with dispatch and can automate more complex repetitive tasks. However, it lacks math functions and help with data entry ORCLE #71 ON READER SERVICE CARD

Merge run and a template for insertion of data. A master document for the classic form letter would include an internal address template composed of variable names that would look like this:

&Mr-Ms& &Firstname& &Lastname& &Title&

&Companyname& &Address1& &Address2&

&City&, &State& &Zip&

This template sets up the format for the incoming data file. Note that each variable name is set off by ampersands. Anytime MailMerge encounters a word enclosed by ampersands, it looks for some live data to substitute. If you include a variable name in the middle of a paragraph, MailMerge will reformat the paragraph in accordance with its original margins and spacing. This technique, or something very similar to it, is the basis of not mail-merge programs.

But that's only the beginning of Madi-Merge's tricks. The program includes a procedural language that lets you set up complex merge max; you can, for example, insert different paragraphs for clients in different regions. To control this kind of "conditional" merger may you embed comtrol commands in your text which Mail-Merge can recognize as such. Mail-Berge can recognize them as commands because, consistent with Workings, 'del command part flush with the left margin. A special IF command can test incoming variables using conventional programming operators like greater than and equal to. Mail-Merge also lets you combine conditional commands using AND and OR operators. Depending on the result of each test, Mail-Merge can skip to different sections of the

master document. If you string a series of MailMerge dot commands together, you can create a MailMerge command file that can automate the production of complex documents and repetitive reports. Suppose, for example, you need to send a monthly income report to a number of managers in your firm and you wish to incorporate data from a spreadsheet. MailMerge lets you set up a command file that prompts the operator for the names of the necessary files. including the mailing list file, the master document, and the ASCII spreadsheet file. MailMerge then prints reports for everyone on your list. Command files are also useful if you want to "filter" your data, producing, for instance, a mailing list of customers with a certain ZIP code

MicroPro's MailMerge does suffer from a few limitations, which could be significant, depending on your needs. It has no math capability. And because the dot commands must be flush left, it cannot insert boilerplate or perform conditional testing within a paraeraph.

Further, WordStar offers no significant help in creating MailMerge data files. Unless you use another program to help with data entry, you have to use WordStar's "nondocument" editor to create the neessary ASCII file. Because you can't aditast the tab settines on this editor (they're preset at every eight characters), data entry is even more tedious and error prone than with an editor that offers adjustable tabs.

Finally, when you're printing a Mail-Merge run, you can't edit another Word-Star document. MailMerge takes control of the computer until it's done printing. However, you can preview your merge output by sending it to disk and then scanning the resulting file.

Still, MailMerge remains a powerful contender among mail-merge programs. Like WordStar itself, this classic program has lots of life left in it.

#### WORDSTAR 2000 MAILMERGE

WordStar 2000's MailMerge is a kissing cousin of MicroPro's original MailMerge. Sold as part of the basic WordStar 2000 package, this MailMerge shares many of the talents and limitations of its older namesake, but it adds a few power features of its own.

Like the original MailMerge, WordSlar 2009's MailMerge includes a powerful command language that has conditional statements and programming-style operators such as AND, OR, and NOT functions. Also like WordSlar's MailMerge, wordSlar 2005's MailMerge accepts the comma-delimited data files exported by most database software.

The main difference between the two MatiMerges is in the way they produce master documents. With WordSur 2000, vinited of typing MailMerge commands into the body of the text, you select this appropriate command from a Mailmand from a Mailmand from a Mailmand from a Mailmand from a WordSur 2000 the automatical places the command in text for you clear the WordSur 2000 formatting commands, the Mailmarge commands are invisible unless you tell the program to display them.

The advantage of this menu-driven approach is that you don't have to remember a lot of command abbreviations like FI for FILE INSERT, so you'e less likely produce syntax errors. However, you still have to remember where to embed the commands. We recommend that you follow the examples in the manual closely to make sure that you implant all the com-



With WordStar Professional's MailMerge, you can use dot commands to test incoming ZIP codes. The program then inserts different boile-plate into your text depending on the ZIP code.



WordStar 2000's version of MailMerge includes on oncillory program called MailList, which, omong other things, has a data entry template that greatly eoses doto entry chores.

mands in the correct order. One limitation common to both WordStar's and Word-Star 2000's MailMerges is that commands have to be placed flush with the left margin, so you can't include a conditional command in the middle of a paragraph.

Another plus for WordStar 2000's MailMerge is that it offers built-in print spooling for your mail-merge run. However, since this function greatly slows down the program's already less-than-speedy performance, you'll probably want to start your merge run when you don't need your computer for other tasks.

The deluxe WordStar 2000 Plus package features a handy program called Mail-



good choice for a corporate mail-merge pro-

gram if you don't need math functions

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fields for comments. Once you enter the names and addresses, you can sort the search for particular records with just a few keystrokes. You can print labels in sites a few keystrokes. And of course, you can use you MailList database as input for WordStar 2000 St MailMarge. While MailList is certainly a nifty little program, it could stand improvement in a number of areas. First of all, it sorely needs some kind of file-transfation capaneeds some kind of file-transfation capa-

List that makes the chore of data entry a

whole lot easier. MailList comes with a

template that prompts you for the usual

mailing list data, as well as some blank

program, it could stand improvement in a number of areas. First of all, it sorely needs some kind of file-translation capability. If you've already compiled a computerized mailing list using a different program, there is no way to import the data into MailList. And while MailList lets you apply a "filter" for viewing data so that, for example, you select records with the same ZIP code, it cannot write that filtered mailing list to disk. If you want such a filtered mailing list, you can produce it by creating a MailMerge command file that sends the output of the merge run to disk. but this means you have to do an entire merge run every time you want to filter a list by the same criteria. Also lacking in this mail-merger is a math feature.

Even with its limitations, MailList can greatly simplify the most common mailing list management chores. And the way it automates label production has to be seen to be appreciated. If mailing list management is a high priority, WordStar 2000 Plus might be the program for you.

#### NEWWORD 3

NewWord 3, which began life as a Word-Star clone and then went on to develop its own personality, still expresses its roots by using WordStar-style embedded dot commands to control its mail-merge facility.

Up to a point, the commands are interchangeable with those of MicroPro's classic MailMerge. But when you get to the more complex commands, NewWord 3 goes its own way. It ends up being more powerful in some areas than its famous role model, although it suffers from some deficiencies as well.

Like MailMerge, NewWord 3 includes a procedural mail-merge control language that uses IF statements to test incoming data. This powerful language also has a math command that will do calculations for each record in your data file, so that you can prepare invoices and estimates.

If you've had much programming experience, you'll recognize NewWord 3's formatting masks, which are similar to those in BASIC's PRINT USING statement. These allow you to align incoming variables within tables and to make sure that your dollar signs appear in the proper olaces next to the numbers.

NewWord 3 lets you pull the DOS date into your documents at print time. And you can use the program's current page and line numbers in your processing.

One big improvement over WordStar's MailMerge is NewWord's ability to send



the print output to disk; you can use the DOS PRINT command for background printing of a large merge run.

Still, NewWord 3's merge program shares some of MailMerge's shortcomings. Because its dot commands have to be flush left, you cannot insert boilerplate in the middle of a paragraph. And since New-Word 3, like WordStar, doesn't offer variable tab settings in its nondocument editor. creating ASCII data files is more difficult.

NewWord 3 also falls behind Word-Star's MailMerge in one important area. WordStar retains the spacing and margins of your master document when it inserts variables and boilerplate text. NewWord 3. on the other hand, realigns the merged text to match the program's default margins and spacing unless you specifically override the defaults. Thus, for instance, if NewWord 3 inserted live data into an indented paragraph, it would reformat the paragraph to match the default margins. It would only retain the indentation if you included a dot command resetting the margins for that particular paragraph.

Nonetheless, NewWord 3 clearly rivals WordStar's MailMerge. It has most of its power, along with extras like its math command and print-to-disk function. Although it was not yet on the market at this writing, it should be by the time you read this. If you're shopping for a powerful mail-merger, NewWord 3 is definitely worth a close look.

#### MICROSOFT WORD

Because Microsoft Word, Version 2.0, speaks the language of picas, points, and inches as well as columns and lines and because of its formidable formatting talents, it has a loyal following among those who need to fine-tune the appearance of the printed page-especially those who have access to laser printers.

It's no accident then that Microsoft Word's mail-merge program offers those same advantages. Microsoft Word takes in stride formatting feats that other merge programs find daunting. That's because Microsoft Word preserves the formatting and fonts in your master document. You never have to worry about changing the margins, line spacing, or fonts in your boilerplate text. They automatically change to match your master document. If you want your variables to appear in a special typeface, simply assign the typeface to the appropriate variable names. Or if you want your variables to line up in neat tables, just align the variable names using Word's tab settings, which specify left, right, center, or decimal alignment.

Word's built-in column formats also simplify the often-maddening task of printing mailing labels in multiple columns, the so-called two-up and three-up formats. Word's manual includes easy-tofollow instructions for setting up multiple column labels that can take a lot of pain out of the process. (If you use an Epson MX series printer, the instructions won't work. You can save yourself time and frustration if you call Microsoft's technical support and ask for the simple but not obvious fix.) Variables and commands are embed-



Microsoft Word allows precise control over the format of your merges. This split screen shows a merge master document and a data file. Merged, they produce a table with





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PG-CONNECTION I

ded in the master document, separated from the main text by double-caret brackets << and >>. Unlike the dot commands in MicroPro's MailMerge, the commands don't have to be flush with the left margin; boilerplate text and conditional commands can appear in the middle of a paragraph.

paragraph.

Microsoft Word is also ahead of the pack in its approach to organizing data lifes. It accepts the common comma-de-limited format produced by many database packages. But it also accepts Microsoft Word on a large of the state of the packages. The state of the packages that it also accepts Microsoft Word on the packages that also accepts Microsoft Word on the packages that has been supported by the stops. This filter format greatly simplifies data entry because you hit a single key, the Tab key, after entering each data item. Also, beautiful the case the data is aligned in columns, it's harder to inadvertently own an item.

Nonetheless, Microsoft Word's mailmerger isn't perfect. Perhaps the most troublesome drawback is the lack of an easy way to preview merge output. Since it can take several test runs to debug the command sequence in a master document, especially if you use complex conditional statements, plan on using up quite a bit of paper for testing.

pager to usuage.

Microsoff Word's merger eats up computer time as well as paper. Once you merge run is ready to go, there is no way to send the output to a disk file for later printing. Nor will Word's built-in print spooler manage the merge run. So don't start a lengthy merge run when you need your PC for other tasks. Microsoft Word's merger

wants the computer all to itself.

Less seriously, Microsoft Word lacks math and sorting abilities, so you'll have to invest in a database program if you want to send out invoices or do batch math calcula-

tions.

Despite its drawbacks, there's a lot of power in Microsoft Word's merge program. If you need heavy-duty control over the format of your final printed documents, it's a serious contender.

#### DISPLAYWRITE 3

Display Wire 2 is a full-featured word processing package from 18M that includes a powerful mail-merge capability. You can build data files directly, using Display-Wire sown conventions for naming variables in a data file, or merge DisplayWire text files with data from files created using programs like VisCocie, 1-2.3. Multiplan, and alBase II. DisplayWire 3 lets, you incorporate addition, subtraction, multiplication, and division into your text and the properties of the properties of the conposition of the properties of the contraction of the properties of the contraction of the properties of the contraction of the properties of the protest and enclosing them in exclamation

The package itself is popular—or at least widely distributed—in large corporations where the choice of PC software was probably left to someone with a high tolerance for technical jargon, or whose selection is influenced by those three little lef-

points (!name!).

#### MAIL-MERGE WISH LIST

What do power mail-merge users really want? For starters, speed, flexibility, ease of use, and freedom from cryptic codes.

In reviewing mail-merge packages we found that they all fall short in some way or another. Here's our conception of the ultimate mail-merge product that incorporates all the features on our wish list.

The ideal package won't limit us to the ten or so fields that commonly appear on a mailing label or phone list. We want to be able to add our own defined fields of any length or at least up to 128 characters)—including a full sentence—and to merge-print that sentence field for a more personalized form letter.

We also want to be able to sort by any of these fields, including by multiple criteria (such as company and city). The ultimate mail-merger should be able to select records that match a string (name=Smith), fall within a range (ZIP between 94100 and 95000), and let us specify by IFA/ND/OR criteria (IF balance>0 AND date>12/1 OR date

We'd like a mail-merger to make it easy to design printout formats and position merged data any where on the page—including three-across labels. The ideal package would also let us merge data into paragraph text and, if necessary, automatically reformat the paragraph at printout time to match selected

margins.
Few encumbrances are as irritating as getting half-way through printing a long getting half-way through printing a long series of letters or labels, being stopped by a paper jam, and then discovering that you must either start the print job over from the beginning or delete the already-printed records from the file. Our plea is for a package that lets us resume an internuted series of letters or labels at what-

Of course, with the sophisticated word processors now available, our wish list includes a mail-merger that can handle all the text styles our equipment is capable of producing (for example, print-

ever point we choose

ing some fields in boldface or italic). If several fonts are available, we want those, too.

The last item on our list concerns merging a text file with data from a variety of sources—comma-climited AS-CII, DIF, or SYLK formats from spreadsheets and databases. We want to be able to handle data that comes from any type of file format used in daily business on the PC.

Perhaps most important of all, the program should be free of cryptic codes and complex programming calls. How ironic that one of the most commonly used applications can all too often be one of the most (unnecessarily) complex to work with.

Of course, no single mail-merge application requires all of these features at one time, but overall, these are the features we find we need the most. Perhaps one day we'll see a package that includes them—Diane Burns and S. Venit ters: IBM. The program is menu-driven, but the menu prompts are often to compete a rollent to compete a rollent to compete a rollent to understand unless you have already read through the two-volume, cloud either an ord-fix tutorial or sample files. Compared with the other programs reviewed here, Diplepoly Write Jaha palipoly Write Jaha palipoly Write Jaha palipoly Write Jaha palipoly Write Jaha paling with the longest learning curve. A formal 1- or 2-day hands-on training session would be well worth the investment for anyone buying this post-learning this p

One example of DisplayWrite 3's long learning curve is in merging text with a spreadsheet or database file. A submenu prompts you to identify the file format as fixed-length, BASIC sequential, DIF, SYLK, PDS, or dBASE II. Five lines at the bottom of the screen identify the corporations that own these trademarked names, but actual program names are not included here or on the help screen. You need to search the manual to discover, for example, that 1-2-3 and VisiCalc files store files in DIF format. To some this may seem like common knowledge that is not worth a second thought, but it would be handy if the screen prompts offered more help to nontechnical users. DisplayWrite 3 is the kind of program that can keep an in-house maven happily answering distressed users' questions forever.

If you are not using data created by another program, DisplayWrite 3 makes setting up a data file a bit simpler—perhaps even simpler than some of the other programs, in which you must keep track of commus, quotation marks, and carriage returns. You simply type the field name (using the syntax shown below) on each line followed by the field entry.

!name! Mr. J. Allen !company! CBA Co. !address! 123 Main !city! Sacramento. CA 99999

Since every record needs the same set of labels, you can simplify this process by typing in the basic label set once, duplicating it for every record, and then going back and filling in the variable data. You can save disk storage space by keeping field names short. Each record must be typed on a different page in the data file.

You can set up conditional text starements based on whether a field is empty or not. For instance, you can tell the program "life states field is empty, print "NY". by entering ""/II Empty, "STATE/N-TO, "STATE "NY". by entering ""/II Empty, "STATE/N-TO, "To start empty, and to empty and compty, print "Payment due upon receipt of invoice" "by entering /II Not Empty, AMOUNT. Payment due upon receipt of invoice "be invoice "Empty, and to specify combinations II/"/ You can sho specify combinations the field is empty, print "Your account is the field is enjoy, print "You recount in the field is empty, print "You recount in the field is empty, print "You recount in the field is not empty, or the start in the start in the field is not empty, or the start in the start in the field is not empty, or the start in the start

print Thank you for your payment. "
Although Display Write 3 is powerful in that it lets you take advantage of math functions and merge files created by some spreadsheet and database programs, some of the features it's missing may be too critical to live without. You cannot print three-

across labels in DisployWire 3. Nor can you sort records or select subsets of data files to be merged. You cannot set up conditional statements based on numerical displays and the selection of the selection x. ..., You cannot merge comma-delimited files with DisployWire 3 text files. X. D. Spaly Divire files are stored in EBCDIC, cather than ASCI formar The Could make a difference if you need to elecontinuate files to other stations that equire ASCI character data.

#### DisplayWrite 3 can keep an in-house maven happily answering users' questions forever.

DisplayWire 3's mail-merge features are just not say rough to compensate for its outsided user interface. Its special features are most likely to appeal to users who tabases and who need to print data from these files in other formats, since DisplayWire 3 can serve as a report writer for these other programs. If you have not already invested heavily in DisplayWire 3 as a word processor, some of the other would probably prove to be more immediately productive.



by from other programs such as 1-2-3 and dBASE II makes DisplayWrite 3 an excellent report writer as well as a flexible mailing list handler. Unfortunately, the technical tone of the program's menus and manual make it diffificult for nonicefuncial users to learn. CIPCLE MY ON PEACHS SERVICE CAPO



With Display Write 3, complexity translates into flexibility. You can, for example, merge files in a variety of formats, like DIF, SYLK, and dBASE II, into the same text file.

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it does everything the Bernoulli does (and then some), it doesn't need half your desk to do it. Diskit 2 is designed to fit right under your monitor. In other words, "zero footprint." But you'll certainly know it's there.

Diskit 2, with twin 10MB removable Winchester cartridges, is twice as fast as Bernoulli when compared in self-booting modes. Using both read and write functions in copying data from drive to drive, Diskit 2 outperformed Bernoulli by a factor of two.

Diskit 2 is easy to install. You just plug it in, type "INSTALL" and you're up and running.

# Nice to drive, but tough to park.



(That's about the same time it would take to scan the first paragraph of the Bernoulli manual.)

The Diskit 2 cartridge drives are based on the latest in Winchester technology and offer virtually unlimited capacity for storage-intensive applications. And since the cartridges are pocket-size, 5%," they are easily removable for the utmost in data security.

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For more information, see your local dealer or call IDEA at 1-800-257-5027.



ssociates, Inc., 35 Dunham Road, Billerica, MA 0821 (617) 663-6878 Telex 4979780, France, Switzerland, United Kingdor indemnts of the International Business Machines Corporation. The BRIV indicates a regiment of The Benoulli Box to a regiment undersate of International Conference on the Conference of the Conference on the Conference o

#### WORDPERFECT

At first glance, WordPrefect from Satellites Software International (SSI) would seem to lack a programmable mail-merger feature, the prerequisite for inclusion in this collection of reviews. Unlike the other mail-merge programs in this survey, WordPrefect's mail-merger doesn't offer embedded IF. .. THEN commands that can test variables in the merging data file and direct further processing.

Yet WordPerfect can do conditional merges all the same, thanks to its powerful macro capability. Not only can WordPerfect's macros record command and text sequences to be recalled in a few keystrokes, they can also make simple decisions. So, if you use macros to invoke your mailmerge, you can create automated, "conditional" merge nuns that rival anything you can create with WordStar's MailMerge or Microsoft Word.

Metosigy Word.

The mero approach has several distinct advantages over the conventional entire control of the conventional entire control of the control of

One drawback of the macro method is hard flyou make a missake while recording a macro, or if you need to revise an existing macro, you have to start recording all over again, right from the beginning. You can solve this problem, however, if you incan solve this problem, however, if you incan solve this problem, however, if you have, which should be available by the mey our eard this. The WordPerfeet Library, a desktop organizer with a populguicalistist and calendar, includes a program that allows, you to edit WordPerfeet and allows you to edit WordPerfeet as clifeboard and a prover meditor.

as a clipboard and a program editor.

If you're familiar with macros offered
by other programs, you may be wondering

cisions." This is how it works. Wordbefeet's conditional macros are three-part macros that use the program's search command. The first macro invokes the search, branching to a second macro if the search is successful and to a bird macro if the search fails.

Although the manual doesn't explain how to set un a conditional merce run us-

Although the manual doesn't explain how to set up a conditional merge run using macros, it's not hard to figure out oncyou understand how the macros work.
Since you can "chain" WordPerfert mators together so that one macro invokes the
next, you can set up a series of chained
macros that control a conditional merge
run. The first macro would start the merge
run, and then a conditional search macrocould insert different boilerplate files denending on the results of the wearch.

You can also create WordPerfect macros that help you with data entry, probably the most onerous chore in most mailmerge systems. For instance, I was able to create a set of macros that prompted me for the names and addresses in my data file as if I were filling in a form on-screen. If you use the macros together with the program's math feature, you can automate the production of invoices and other merged reports that require calculation.

Another plus for WordPerfect's mailmerger is its two-stage structure. Instead of sending output directly to the printer, it sends the merged document to the screen as a regular WordPerfect document. This way, you can quickly review merge results before you print and use WordPerfect's built-in print spooling to free your comput-

er for other tasks while the run occurs. Still, WordPerfect's mail-merger does not earn a perfect score. One problem is that the program employs a proprietary data format instead of the more convenient and commonly used comma-delimited data files. With the WordPerfect format, you have to press a function key after typing each data item. Also, each data item occupies its own line in the file, a format that makes it difficult to proofread your data file. Happily. WordPerfect can easily translate comma-delimited and DIF files into its own data format, making it easy to import data from database programs and spreadsheets.

Another minor inconvenience in Word-Perfect's mail-merger is that it doesn't use



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WordPerfect macros let you easily cussomize invoices. In this example, you can merge the master invoice in the top window with the data file in the bottom window and then execute the math command to print the invoices.

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DisplayWrite 3	\$450	Fixed-field ASCII					•	•		•					•	•		•	•
Microselt Word	\$395	Comma-delimited ASCII. proprietary		T	•		•	•					•			•	•		
NewWord 3	\$349	Comma-delimited ASCII			•		•	•	•	•	•	•	•		•		•	•	•
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SuperWriter	\$295	Fixed-field ASCII, proprietary					•	•	•	•	•	•	•		•	•	•		
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WordStar 2000/ WordStar 2000 Plus	\$495 Basic \$595 Plus	Comma-delimited ASCII	•			•	•	•	•	•	•		•	•	•		•		•

descriptive variable names such as "zipcode." Instead, WordPerfect refers to a variable by its position in the data record. Thus, if the ZIP code were the fifth item in your data records, you would refer to it as "F5" for "field number 5."

From DIF SYLX DBF From DIF ASCII 1Wm Perfect Calc 11Wm Calc Result • means yes

Mail-Merge Programs: Summary of Features

WordPerfect does, however, score well on most of our tests and offers a nearly complete complement of features. Its creative use of macros makes WordPerfect's prodigious power accessible even to nonprogrammers. WordPerfect has justly earned a reputation as one of the most powerful, well-designed word processors in the PC marketplace. Its mail-merge feature more than lives up to that reputation.

#### PERFECT WRITER AND PERFECT FILER

Perfect Filer is a flexible, easy-to-use database program. Used in conjunction with Perfect Writer, it can also produce mailing to use in printing the records, the number

labels, form letters, and other merged documents. With clear prompts and pop-down menus, this set of programs is one of the easiest to learn and use of all the packages reviewed here, largely because its menu selections help you perform functions for which other packages require embedded programming codes, letting you avoid memorizing commands and debugging

keyed entries. A simple mailing label created in Perfect Writer consists of field names enclosed in angle brackets. For example:

<first.name> <last.name> <company>

<street> <city>. <state> <zip>

To print labels, you open a Perfect Filer

data file and use the cursor keys to select Print Labels from the main menu. The screen then prompts you to enter the name of the Perfect Writer bollerplate you want

of lines from label top to label top, the number of labels across the page, and the number of spaces from the left edge of one



Costa Mesa, CA 92626 (714) 261-6000 List Price: \$199 for

Writer, \$199 for File Requires: 128K RAM, two disk drives

In Short: One of the easiest packages to use of all those reviewed here, and one of the few that can produce three-across mailing labels. Unfortunately, you cannot convert data files from other programs to Perfect Filer format.

and the second second second

column to the left edge of the next. In other words, the same boilerplate can be used to print one-column, two-column, or threecolumn labels of any size.

You create boilerplate text using Perfect Writer; Perfect Filer controls the merge functions. Perfect Filer incorporates most of the features you'd want in a simple file package, including the ability to sort records using up to nine sort keys, to select records by comparing field values with selection criteria, and to enter data through on-screen forms. You can define up to 128 fields per record; the number of records you can build is limited only by available disk space. You can store up to 16 different files on a single floppy disk, although the manual recommends that you use one disk per file unless your files will remain small.

Data entry forms are easy to create by simply entering underscores and (optional) labels for each field. Once you have arranged the fields on-screen and onted to begin defining the fields, prompts appear to guide you. One prompt asks you to name the field, another asks, "Will the field contain only numbers?" You can set selection criteria to match a string of characters (including wildcards) or to fall within a numerical range (equal to, not equal to, greater than, greater than or equal to, less than, less than or equal to). You can create the equivalent of an IF . . . AND statement by setting up selection criteria in more than one field-ZIP codes beginning with 941 and salary greater than \$25,000. for instance-but there is no IF . . . OR equivalent in Perfect Filer.

One especially nice feature of the Perfect Writer/Perfect Filer combo is its ability to identify selected groups of records by name and to store names for up to 16 different record groupings per file. Once a group is defined and named, you can make a simple menu selection to identify those records for printing. An address record that is included in three different groups named "California," "Regular\_Account," and "Jan Sales," for example, would receive all general announcements mailed to California residents, the special offers mailed to regular account customers, and an invoice at the end of January. You can also set up temporary selection criteria at the time of printing

You cannot include formulas in Perfect Filer fields, but you can convert date in the Perfect Cale spreadsheet package into the Perfect Filer. If, for example, you make all your record entries in Perfect Calesys, to calculate invoice totals—you can then convert the spreadsheet data to Perfect Filer for it to generale invoices. Unfortunately, you cannot convert comma-deinitied files from other vendors programs for one with Perfect Filer because the Pergent for one with Perfect Filer because the Pergent for one with Perfect Filer because the Pergent for more control of the Perfect Filer because the Pergent for more control of the Perfect Filer because the Pergent for more control of the Perfect Filer because the Pergent for more control of the Perfect Filer because the Pergent for more control of the Perfect Filer because the Pergent for more control of the Perfect Filer because the Perpension of the Perfect Filer because the Perfect Filer

The manuals for the Perfect packages are well illustrated and easy to read and reference. Each book begins with a simple tutorial, follows with chapters describing each of the program's major functions, and ends with a complete set of practical examples of business applications (some of which are included as sample files on the program disk). The pages are attractively

designed, and the manual is bound like most of the soft-cover computer books you see in bookstores. The result is a highquality guide to operations that eliminates the irksome necessity of buying how-to books from independent publishers and mercifully provides all the answers in one handy volume.

Anyone whose data isn't already tied up in some other program ought to consider the Perfect set for mail-merge applications. It's much easier to learn and use than most, and it incorporates almost all of the features you'd look for in a mail-merger.

#### SUPERWRITER

SuperWriter. Version 1.03's mail-merge feature has plenty of power, but getting it to work takes perseverance, skill, and luck, not to mention an occasional call to



Perfect Writer/Perfect Filer's easy-to-use men system mokes setting up merges a snap. Yau print three-ocross labels by simply following the prunpts ond typing in how many labels acrass you wout.

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sabella Hastingaŭ Pesidento Hastings Information Services: from your text with the backstash (\). Since commands do not have to be flush with the left margin, you can merge boilerplote files directly into existing paragraphs.

SuperWriter sets its

meree cammands aff

formatting and

PC MAGAZINE # APRIL 29. 1986

the manufacturer, Computer Associates. Because the manual leaves out vital details, even putting together a simple merge run can be a complex chore.

Still, there's a lot of meat here. Once you figure out how to use it, you'll find features that any programming jock would love. In addition to a merge language with IF . . THEN statements, SuperWriter of Fers a wealth of extra mocessing controls.

ites a weatur or extra processing contions. If you want to start processing at the 50th record in your data file and stop at the 50th record in your data file and stop at the 11th of the 11th of 11

and attem.

If you want to get even fancier, SuperWriter will let you examine some of its
own internal variables. You can pull the
DOS date into your documents or refer to
the current page number, column number,
line number, or record number in your processing. Those features are useful if you
want to refer to figures or illustrations in
other sections of your document.

You can also prompt the operator for keyboard responses at print time—handy if you want to include a personalized phrase or paragraph for a few of the people on your mailing list. SuperWriter offers a powerful macro facility that lets you fully automate a merze run.

SuperWriter separates its commands from the main text by using backslashes

(\). Unlike the MicroPro MailMerge commands, these do not have to be flush left, so you can merge boilerplate into the middle of an existing paragraph.

Unfortunately, getting all of this power working for you can be a long and frustrating process. A program this complex needs a detailed, well-organized manual, and the SuperWriter manual is neither. It omits vital information.

I had problems getting SuperWriter to perform even the simplest merge functions because of missing information. My troubles began when I tried to use an address file created by my database program. Instead of the usual comma-delimited format, SuperWriter needs its own special data formats. One acceptable format, which some database packages can produce, is a tabular, spreadsheetlike format in which each data item begins in the same column on each line. You then have to do some precise bookkeeping, telling SuperWriter how many characters are in each record and in each data item. You'll get a very jumbled mail merge if your count is off-a mistake that is almost guaranteed since the manual doesn't tell you that your count has to include the carriage return and line-feed on each line. I figured this out on my own after a very frustrating hour.

The tabular data format also gave me trouble when I tried to print three-in-a-row mailing labels. SuperWriter balked, and not even the technical folks at Computer Associates could explain why.

SuperWriter's other data format, in which each data item appears on its own line, is less troublesome because you don't have to keep track of the length of your records. Using this format, I was able to print three-in-a-row labels with ease. However, this format is not as common as

comma-delimited.

In sum, SuperWriter has a muscular mail-merger, but even experienced programmers will wince and grimace in the attempt to flex it.

#### WORD RESULT

Word Result is a self-contained word processing package for MS-DOS that inrocludes a mail-mere quability. It includes a mail-mere quability. It includes a mail-mere quability it, includes a mail-mere quability in the confices, including simple math functions, as well as some unusual options such as condensed or reversed (white-on-black) text if your printer can handle it. You can arrange data wherever you like through a merge document and sort records and extract subsets of records from a file.

You define a data file by setting up a data-entry form that lists up to 14 field names down the first column in vertical format:

Name : Kim Morrow
Company : Acme Tool & Dye
Address : 4545 Unin Way
City : Milbrae

State : WA ZIP : 99999

A field can be up to 60 characters in length. The total number of records you can store depends on the size of each record, but the manual suggests that if your records are about 150 characters each, you will be limited to under 2,000 records in a



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#### ■ MAIL-MERGE

single file—not many, by some standards.
The data file (or "register" as it is called in this system) is always automatically sorted by key field; only one key field is allowed per register. You can create additional registers that sort the same data under a different key field.

#### ■ Word Result

incorporates all the basic features required by most

offices as well as some unusual options.

You select subsets of records by creating "mapse" in officiate selection criteria for each field. Selection criteria for each field. Selection criteria take once of two forms: match the entered value exactly or select records that fall within an entered amage of values. Once you have created a range of values. Once you have created to their the "positive" version of the map or a "regastive" version that shows only those records not selected. You can store more almost one of the properties of t

and the text decument, such as form text you don'tly variable names by using the function keys. You cannot distinguish between variable names and normal text while in entry mode, but a function key changes the screen to display a highlighted changes the screen to display a highlighted through the contract of the cont

can install it on a hard disk system and then uninstall it (following procedures specified in the manual) to move it to another hard disk or program disk.

Although you can bring straight ASCII text into a text file under Word Result, the program cannot read data files created by

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Datavue compatible.

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Lotus 1-2-3 <sup>M</sup>, Multi-Plan <sup>M</sup>, Super-Calc <sup>T</sup>
and all the rest. That means you can work on your IBM PC at the office; then take the same diskettes home with your runs on Parante.

you can work on your truth VL at the Office; then rake the same disletters home with you to use on Dravoe. Builtin 5-1/4" drive and RAM drive software less you wasp 5-1/4" to you can expand the part of the Control of

The small computer that's big on features.

that's big on features.

Datavue features a detachable low-profile sculptured keyboard with that IBM-type touch and 10 function keys for special software. Its cordless infrared operation doesn't tie you

A full-sized 80 x 25 line display lets you run text or graphics. And six different screen palettes allow

ferent screen palettes allow you to fine tune the greys and blacks according to the software you're using. If it's color graphics you're looking for, just plug an ROB monitor into the standard port.

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drive.

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#### ■ MAIL-MERGE

■ Word Result is menudriven, although you can execute 25 commands with the function keys.

other programs, including comma-delimited files.

The package lets you select from 11 differrent language keyboards (U. S., Friech, German, Spanish, Italian, English, Swefish, Danish, Novegjan, Finnish, and Israell). The manual itself uses some unconventional terms the data file is called a "register," for instance, and parameters that follow a command are called the command are called the command of the command of the ten and casy to follow. One third of the ten and casy to follow. One third of the 159-page manual is devoted to a interial that takes you through all the basic steps in 3 short lessons the remainder of the documentation consists of a reference section organized by function.

The program is menu-driven and incorporates on-line help. You make menu selections using the cursor keys. As an alternative, you can execute the 25 primary commands using the ten function keys in combination with the Shift and Alt keys; some of these commands invoke submenus of parameters. The commenus or

Weed Breads
Handle Software AB
Observer AB

In Short: Word Result ofters most of the word processing features needed for production of mailing lists and letters as well as reports. It is easy to learn and use, though advanced operators may find the absence of shortcuts frustrating. CPICL 483 OFFECTH STANCE CAND parameters associated with each function key are always shown along the bottom of the screen. These aids, and the fact that the word processing program itself is rather simple in the functions it offers, make

Word Result easy to learn and use.

Dara Pearlman, Diane Burns, and S. Venit are frequent contributors to PC Magazine.

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# The PC's New Frontier USIC

mong classical musicians, it's an old joke to say that a hapless singer has a voice like a conductor. This choule-edged put-down also holds for the IBM PC's musical talents. The PC is weak as a singer of songe, but potentially very powerful as a conductor. The newest musical software is designed to take advantage of the PC in this stronger or the PC in this stronger of the PC in this stronger or the PC in this stronger or

The IBM PC's musical limitations and those of most alternative all-pure play only a single note at a time through its built-in speaker, and here's no way to control how food it worbles and here's no way to control how food it worbles and here's no way to control how food it worbles and PCP included—are musical profligies, thunks to specialized sound chips that can generate three or four simultaneous voices in harmony. Owing to this hardware advantage, most of the interesting musical software that uses the MIDI standard for electronic music (see sideuate in PCs, but at the Curnocker 64 and the Apple II series, Which is a shame because, as some business used.

Despite their severely limited sense of sound, personal computers, when teamed up with a synthesizer and the right software, can

make music—which could be good for business.

ers have begun to discover, the most effective way to tone up presentation graphics is to create a musical background.

Now a new generation of MIDI-compatible sonic software has arrived, and the best of these programs can put an IBM PC at the center of an ensemble of state-of-theart synthesizers. With the new programs, called sequencers, a single PC can direct a performance by 16 synthesizers, each instrument phaying a different part. (See sickbar, "Software Sequences.") Other programs enable the PC to capture an improvised performance and display it in a notated form that a musician could revise on the PC's screen. Still other programs let the PC teach synthesizers how to produce new types of sounds and maintain a repertoire of different voices.

THE MUSICIAN'S CHOICE Musical software is making computers popular with musicians for the most compelling reason-money. Synthesizer players and composers often find that a personal computer programmed for music costs less than dedicated music hardware of the same capability. If the PC can emulate several musical devices at once or offer a greater storage capacity, the cost advantages multiply. Also, when more-powerful products come along, it is less expensive to upgrade or replace software than specialized boxes of musical hardware. For less than \$1,000, you can equip a PC with music software, a MIDI interface card, and a keyboard synthesizer like Casio's CZ-101, which lists at \$499 and is sometimes discounted as low as \$280 (Casio Inc., Electronic Musical Instrument Division, 15 Gardner Rd., Fairfield, NJ 07006; (201) 882-1493). With equipment like this run by someone with a musical background, companies that use PCs to create business-presentation graphics could easily augment and enhance their presentations with synchronized sound.

The PC also offers musicians unique advantages that can help them underbid the competition. Roger Powell, a musician in the rock band Utopia and programmer of Texture, says that the computer helps him work more efficiently in the recording studio. (Texture-from Cherry Lane Technologies, P.O. Box 430, Chester, NY 10537; (914) 937-8601-is currently being revised and was not available for this review.) Powell is often contracted to create sound and music accompaniments for commercial audiovisual presentations. "With these machines," he says, "I can undercut everyone else in New York when bidding on these jobs." Powell says he doesn't have to spend as much time in expensive recording studios because the computer is already programmed to let multiple synthesizers perform a composition in a single take. If a client wants

changes in the music, it's easy to make them on the spot with the computer and the right software.

This review examines four programs that can turn a personal computer into a musical prodigy: Octave Plateau Electronics' Sequencer Plus, Personal Composer from Standard Productions. MIDI Ensemble from Sight & Sound Music Software Inc., and Music Processing System from Roland Music Software. Any of these will accomplish the major task of letting you compose and edit music with your PC, but each includes unique features that may suit users with special needs.



I EDITOR'S CHOICE

For recording and coordinating instruments on a MIDI system. Sequencer Plus stands out, offering a clear user interface that lets you make good selections while speedily recording and editing a composition. Personal Composer is a good choice when traditional music notation is needed. The notation can be printed out or used to drive synthesizers directly.

#### SEQUENCER PLUS

Sequencer Plus. Version 2.0, is a music sequencer that puts an amazing amount of information in front of you but at the same time succeeds in keeping it from overwhelming you. You can jump in a flash from one screen or window to another for different points of view on the music, and somehow never get confounded. If you stop to think about where you've just been, you might break out in a cold sweat.

The relationships between the separate parts of the program are extremely well structured and integrated, so that your movements through a composition can become instinctive very quickly. A single keysticke testaffy zooms you down to a screen that contains a more finely detailed perspective; the Esc key takes you back up to the previous level.

THE TRACKS START HERE The main screen lists the program's 64 tracks in a scrolling window directory. That's a lot of tracks to keep track of, but you can label each with a short descriptive phrase and assign it to a MIDI channel or transpose it to another octave or interval. You can also inout the number of the first programmed voice you wish the instrument receiving that track to use (Sequencer Plus starts its numbering with 0 so you may have to subtract I from the number that actually apnears on the instrument).

You select the track you want to record on from a MIDI instrument by putting the cursor in its row, then hitting the R key and the Space bar. To play back what you've just recorded, you need only hit the Space bar. When playing back the music, you can opt to hear only a single track by turning on its Solo flag, or you can ignore some tracks temporarily by activating their Mute flags.

For a more detailed view of what you've recorded on all the tracks, press the V key. Some of the information that was in each track's line on the Main screen will be replaced by a line of character-size symbols, one representing each measure of the track. The symbols clearly identify which measures are untouched, which have been recorded on, and which actually contain notes or other musical data.

EDITING Moving the cursor onto one of a track's measure symbols and pressing the E key brings up an Edit screen that lets



Remires: 256K RAM, one disk drive, DOS 2.0 or later, MIDI interface (Roland MPU) 401 MIDI Processing Unit or Octave Pfa teau's OP-40011 In Short: Provides a MIDI recording console with an excellent user interface. Sophisticaled and a pleasure to use throughout

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you zoom in and examine the measure in detail. The middle window of the Edit screen looks like a section of an old player-piano roll—notes are indicated by glowing bars that resemble the slots cut into a roll's paper strip.

At any given time the screen displays a single octave's worth of notes (13 seminoes). As you arrive at each measure, Scquencer Plus automatically readjusts its octave range so that it displays the highest concentration of recorded notes. By using the vertical cursor keys, you can search through the entire 128-semitone range that the MIDI data format can account for.

In the Edit screen or other measure-level modes, pressing the Space bar tells Sequencer Plus to play the music beginning with the measure you currently occupy. While the music is sounding, the measures displayed for that track will automatically

■ Synthesizer players and composers often find that a PC programmed for music costs less than dedicated music hardware with the same capability.

advance, but you can override this to scroll to any part of the composition you want without interrupting the playback.

You can move from measure to measure using the shifted Cursor Right and Cursor Left keys. You can move quickly to the first or last bar of a song by pressing the Home or End keys. A Goto command will take you directly to a numbered mea-

The beginning, end, and duration of cach note are indicated by its bar's hericontal position and length. The bar's vertical position indicates its pitch, which you can identify on a scale at the left side of the screen. You can erase notes or insert new ones, taking an existing note as a model or cutting new ones to size. You can change the rhythm and pitch of notes by seizing

#### THE MIDI STANDARD

Digital computers and musical instruments are able to communicate thanks to a common language; the Musical Instrument Digital Interface.

In olden times, computer music programmers were lift largely to their own devices, patching together systems and software that they alone could use and understand. But several years ago ment agreed to use candusfized data formusts, protocols, and hardware on instruments that could exchange digital information. The resulting MIDI (Musical Instrument) Digital interface) subject life to consume that musical equipment from difcessors that musical equipment from the control of the country of t

gether in an integrated system. MID1-compatible instruments are capitped with neckets that can link them to other MID1 devices. The standard to other MID1 devices. The standard pality, According to the MID1 standard, instruments can be finled with up to 50 feet of shielded twisted-pair cable without compromising the data and its timing. The MID1 interfaces operate at a 31.25 kiloband met and can send a 10-bit asynchronous byte (including start and stay bits) erey 3.00 merconculus. Meaton of the standard provinces of the standard only to devices assigned to one of the 16 definible channels on the MID1 system to the MID1 standard only to devices assigned to one of the 16 definible channels on the MID1 system to the MID1 standard to the MID1

The MIDI connections on a device can be of three types. MIDI IN brings a stream of MIDI data into the device. MIDI OUT sends the device's output, including whatever changes and additions the device made, to the data stream. MIDI THIRU passes on the received data unchanged to the MIDI IN of another instrument. When MIDI THIRU connetions chain together a number of devices to the control of the common data stream that arely to its channel.

The data on a channel can be status bytes, which identify the type of data that follows, and data bytes, which indicate specific notes, their loudness, degree of pitch bending, the type of sound to use, and other factors. Digital audio encodes the actual frequencies composing the waveforms that make up the music. MIDI data refers to pitches by number, as they would fall on a piano-like keyboard with 128 keys. The piano's 88 keys fall in the center of that scale, mid-die C is called MIDI note number 60.

In the time stream of MIDI data, each sound is triggered by a Note On byte when its key is pressed (or an equivalent input), and a Note Off byte when the key is released. If a touch-sensitive keyboard is used, the velocity with which the play-or 5 finger strikes a key can be carried as part of the Note On data. In between these two events, data for other control-lers can shape the character of the note, making it louder or softer.

Other MIDI data can be targeted to specific types of instruments. Each manufacturer participating in the MIDI standard is assigned an identification number. If this is transmitted as part of the MIDI data, the bytes that follow are received solely by that manufacturer's machines. Thus each manufacturer can use the MIDI link to ensure proprietary features for its own products without undermining their general compatibility with other MIDI devices. The provisions that permit devices to ignore inapplicable parts of the data stream is a big part of what makes MIDI such an effective universal standard.

The International MIDI Association (IMA) is a central source of information about the MIDI standard. This group publishes a booklet describing the MIDI 1.0 specification, a monthly newsletter, and more detailed documentation for its members. The International MIDI Association is located at 11857 Hartshook St., North Hollywood, CA 91607, (818) 505-8964.—James Langdell

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Shara screen "snapshots." Even when you're running a program the other user doesn't have, in-synch's "snapshot" feature lets you capture any text or graphic screen from your PC, and send it to that user.

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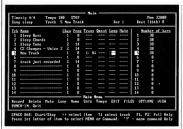
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Sequencer Plus's recording screen is so well integrated with the rest of the program that you can easily move between it and the other modes.

them (individually or in a block) and placing them elsewhere on the screen; a note will retain its original nuance when moved to a new position.

Anything you delete while editing is automatically saved in a buffer file, in case you want to restore it or save it elsewhere. Thus, Sequencere Plus's 72ap command performs the same function as the Move command in most programs. When involved in extensive copying or reorganization within a song, you can maintain up to 11 separate buffers that are filled when you execute the Copy command.

To examine the nuance of a note in more detail, put the cursor on its bar and hit the N key. This sends you to the Note screen, which displays all the controller data that might apply to that note, such as any pitch bending or changing dynamics that affect it.

The special MIDI data for a full measure can be examined and edited on the MIDI mode screen, which you reach by pressing the M. key. Where MIDI events happen in time within the measure, as initial letter identifies the type of event, such as B for note bending or P for program as the property of the p

ORGANIZATION PLUS Sequencer Plus lets you save and load files containing individual tracks or entire songs. From within the program, you can see directories of song or track files on any disk.

The menus and data on each screen are largely self-explanatory. The program's structure is logical enough that you usually can find what you want in the first place you'd think to look. On top of this, Octave Plateau took care to provide an excellent manual and extensive help screens that appear when you press FI to TS.

The lengthy manual covers virtually every aspect of the program twice: first in a tutorial, then afterward in a reference section. The text goes well beyond describing the workings of Sequencer Plus—it's filled with good advice about how to get the best use out of every component in your MID1 system.

All in all, Sequencer Plas is a wellcrafted, professional musical instrument, to recording modes let you work with tracks smoothly and rapidly. And the unusual player-piano format for displaying notes is clear enough so that I earned to read these screens for their musical content in remarkably little time. For most recording projects, Sequencer Plas would be my first-choice program.

#### PERSONAL COMPOSER

The most innovative part of Personal Composer is also the most old-fashioned: this program lets you write traditional musical notation on its screen and then hear the composition played through a synthesizer. More astonishing is its ability to record a synthesizer performance and convert it into reasonably accurate written musical notation.

Musical notation is a complicated language, but Personal Composer is fluent in a wide vocabulary of musical symbols. You must confront this complexity when learning the program. A knowledgeable music reader learning to notate compositions with Personal Composer would have to ascend approximately the same learning curve as a literate person using a typewriter for the first time.

When you start up Personal Composer, it displays a blank screen with a cursor in the center. Wherever you position this cursor, you can insert a musical symbol by typing a two-character command and responding to any subsequent questions.

STAFFING UP THE SCREEN You'll want to hang your notes someplace, so the first thing to add to the screen is a five-line staff. To do this, press the Home key to move the cursor to the screen's upper left-hand corner, then press the D key to drop it down slightly (you can't use higher notes, or ledger lines, if the staff is placed too



close to the top of the screen). Now type the letters ST (the staff command); after you press the first letter, the screen's bottom line will describe all commands that begin with the letter S. You then press the End key to move the cursor to the right side of the screen. Finally, when you press Enter, the computer will draw a staff across the screen.

You can draw more lined staffs to fill the screen, leaving as much space between each as you'd like. If you plan to write keyboard music, pairs of staffs can be joined

#### ■ The most innovative part of *Personal Composer* is also the most oldfashioned: it lets you write music in traditional notation.

with braces, or you can link a number of staffs for an orchestral score. If you need to use more staffs than will fit on a single screen, pressing PgDn will show you the next half-screen of music. Unfortunately, the program can't scroll freely through a full page of music.

Next, the staffs need some basic musical symbols, such as clefs (use the CL command), key signatures (KE), and time signatures (TS). Once you have set up your staffs, you can start entering notes. Position the cursor where you want a notehead to appear, then type NO (the note command), reply to a prompt for the basic length of the note (O for a quarter note, E for an eighth note, and so forth), then answer other questions about whether the stems should be drawn up or down and whether a note that's an eighth or less in duration should be barred together with similar notes. An individual note can be deleted by placing the cursor directly on its notehead and typing NO again. This toggling method can be used to eliminate most musical symbols from the screen. However, the results can be unpredictable

#### SOFTWARE SEQUENCERS

Current music software goes beyond just emulating a sequencer—it can turn a PC into a recording studio, complete with master mixing console.

A sequencer is a device that can record damd store a series of notes, then feed them into an instrument at the proper tempo. A sequencer can store several note patterns and output them simultanocusly or sequentially, repeating one note pattern a given number of times be-

fore playing the next pattern. With software that now exists, a FC can act like a basic sequence for a MID system and do much more. It can expand system and do much more it can expand not expended to the performance data along with the raw notes; dynamic levels, pinch bending, aftertouch, and signals from any sort of continuous controlled a synthesizer might use. Since the PC has a larger memory capacity than any dedicated sequencer, it can use masses software that stores more more calculated and to the control of the control

But a PC can do more than just sequencing. The PC's keyboard and screen offer a more flexible system for displaying and manipulating music than is available on most music devices. When dealing with MID data, a PC can be used like the tape recorders and master mixing console in a recording studie.

All four of the programs reviewed here can record musical input on for multiple tracks within the compater's memory (from 8 to 64, depending on the program) and play the music back through any of the 16 MID channels simultaneous between the 16 MID channels simultaneous between the 16 MID channels simultaneous close of the 16 MID channels simultaneous close of "punch in punch out." When using this feature, you record new material on track between two specified time points. leaving the result and track between two specified time points.

Another musical job that software can do is maintain libraries of voice-changing routines for synthesizers. Many synthesizers allow a musician to program original sounds beyond those that are preprogrammed. The adjustments that

produce a unique voice are referred to as patches, or programs. You can transmit these patches as MIDI data and use a PC to store the patches for loading into the instrument later.

in a sufficient manufacturer's synthesizers use a different manufacturer's synthesizers use a different masso of programmants he voices, so a computer program must be tailored to create panches for particular instruments. Personal Composer is able to serve as the voice (libratian for Yamasowa Carlon and Personal Composer is not reviewed here; rather, only its sequencer aspects are described. Personal Composer is not reviewed here; rather with jet considered in detail when PC Magazitie reviews offine reviews offine and the programman and th

All of these programs are able to call or a synthesizer's different preprogrammed voices by referring to them by murber, even in the middle of a composition. Sometimes a corruptace can tell the anacould be played directly on its key-board. The Casio CZ-101 is able to produce only one type of sound at a time when you play on its key-board, but the computer can sent it instructions on the computer can sent it instructions on the CMID channels that make it sound like a violation is a violation in the case of the case of

Each of these programs lets you exunition musical data for detailed edings. The four programs differ the ness in this mentage from the musical world. Soquence Plan formats its musical data in a way that resemble the pinn of all used on player pinns. as does MIDI Enrandle. Personal Compose was Inadiated musitor's score. Roland: MIPS is similar to it. Tenner which we were unable to review, is organized like a recording studie's to great the programs of the programs of the protact of the programs of the programs of the protact of the programs of

# **Meet ourP**

# Choosing a modem for your personal computer just got easier.

Modems are remarkable little gadgets. They can connect you and your PC to mountains of data and oceans of information. But up until now, deciding which modem to buy hasn't been easy. So to solve that little problem, IBM is offering two 1,200 bps PC modems. Modems that not only give you the best features currently available on PC modems, but also offer features usually found only on higher priced, higher speed modems.

#### First, a Brief Introduction to the IBM PC Modems:

The IBM 5841 is a stand-alone modem capable of operating at 0-300, 600 and 1,200 bps in asynchronous mode, and 600 and 1,200 bps synchronous.

Our other modern is the IBM Personal Computer Modern—an internal, half-card modern that operates at 0-300, 600 and 1,200 bps asynchronous.

#### The Non-Identical Twins

In some respects, these two modems are very smilar. For example, they both have Automatic Adaptive Equalization—which means they will continuously fine-tune themselves to compensate for changes and noises on the telephone line. The result is, you can receive data over a wider range of phone line conditions. This is one of those features more often found on faster, more exensive moderns.

In addition to automatic answering, both modems offer Adaptive Dialing—which means that if you don't specify either tone or pulse dialing, the modems try tone dialing for one digit, and if that doesn't work,

they automatically switch to pulse dialing.

Both modems will automatically re-dial a number as many times as you tell them to. Or if you prefet, they can switch to an alternate number on a busy signal or a no answer. Once a connection is made, the modems automatically detect and adjust to the incoming transmission speed. They can also initiate an automatic log-on sequence including control characters. ID number and password.

And both modems have extensive "Help" menus, a complete complement of bulk-in diagnostics, a programmable speaker, and two phone jacks on the back so both your phone and the modem can be connected to the same line at the same time. You can even switch between voice and data without interrupting the phone call.

#### A Modem with a Memory of Its Own

The IBM 5841 stand-alone modem has some additional features you don't usually find on 1,200 bps modems. For example, the modem is switchable between asynchronous and synchronous modes and has a 20-entry Dialing Directory. Kept in non-volatile

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# **CModems**

storage, the directory enables the modem to dial up and log on to systems automatically. This feature is most convenient when the 5841 is used with a fixed-function ASCII terminal such as the IBM 3161 or 3163.

The front panel of the 5841 has a complete array of eight LED Status Indicators to give you a quick visual check on what's happening.

#### A Half Can Be Better Than a Whole

Why? Because the IBM Personal Computer Modem can use a short slot in the IBM PC XT and the Portable PC. It also fits nicely into a full slot in the IBM PC and the PC AT.

Another nice touch is that a PC diagnostic diskette comes with each of these internal, half-card modems.

#### Standards & Compatibility

You'll be pleased to know that both modems meet the Bell 103/ 212A and V. 22

Stand-Alone. The IBM 5841 1200 bps Modem

> Internal. The IBM Persona Computer 1200 bps Modem

meet the Bell 103/ 212A and V. 22 CCITT standards. Both can use the industry standard "AI" command set, as well as the IBM command set. And both modems have been tested for compatibility with leading PC communications software such as the IBM PC Communications Manager, Crosstalk" XVI, Smartcom II® and Transporter."

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Personal Composer's music-editing screen lets you create a musical score that you can either print out or play through synthesizers.

because the cursor must be in the same location as it was when the symbol was first created. With larger symbols (like clefs), it isn't always clear where that point originally was.

nally was.
You add sharps, flats, rests, ties, bar lines, and fermatas in a similar way. Personal Composer also has a text mode, so that you can place verbal instructions and song lyrics in a score.

You can hear whatever music you've notated on the screen through a synthesizer when you type PL, the play command. In the musical score, you can indicate the MIDI channel each line should be sent to, as well as the preprogrammed voice (identified by number) the instrument should use when performing those notes.

When you want a printed copy of your composition, a do martis graphise printer will start grinding out the lines and spaces at the touch of the PR command. At this point, you'll discover that Personal Composer is really a "what you see is what you get" program, since the Hercules monomer graphise board displays the score with the same level of detail that it will be a some control of the properties that the properties are proported the notation with a command that automatically checks for righthymic errors—a measure of a waltz,

say, into which you tried to cram in 41/2 beats' worth of notes.

Another command can transpose a staff make into another key. The program on tastes transpositions using sharp and natural signs exclusively—even in keys where the equivalent flated notes should be used. Thus the transposed version will sound correct, but you'll have to edit out many accidental signs before you print a finished corp.

MUSICAL MACROS You've probably gotten the impression that you need a lot of keystrokes to put music on the Personal Composer screen. Unfortunately, you're right. But you can spare yourself some of this effort if you use Personal Composer's copy commands when a composition repeats measures or groups of notes. More general relief is available, however, from the program's keystroke-saving macro feature. Personal Composer can store sequences of up to 2,000 keystrokes as you type them in the first time. You can then assign your macro to any two-character combination that isn't already being used as a command

You can create another type of customized two-character commands in *Personal Composer*'s MIDIgraphics mode. Here,

you can plot out new musical symbols on a pixel grid, to be inserted into your mamiscripts when you type the two-character names you assign to them. Lines or blocks of text, such as a repeated phrase in a song lyric, can also be saved as MIDIgraphics. Despite the somewhat misleading name, MIDIgraphics cannot influence the way the music is played by MIDI-compatible instruments; it can only contribute to the appearance of the printed manuscript.

You could potentially save frequently used macros and MIDJgraphics in files to be loaded into the computer before each composing session. Unfortunately Personal Composer can't call up a directory of files on a disk. The manual mentions a command that allows you to execute DOS-level commands, but it's not yet implemented in this version of Personal Composer.

CATURNOS THE KINS Converting a musican's performance into notation is a far tricker task than turning notation into a computer is able to create secure, must do public pairs in the student secure, must do public pairs in the student secure, must do public pairs in the student secure, must do public pairs in the pair than you can odd this computer notated secure and pay the re-viscul evention. The recording mode of Personal Computer does indeed perform this immirace. The results, however, are somewhere the part of the performance of the personal Computer does indeed perform this immirace. The results, however, are somewhere the personal computer and the personal computer of the personal control of the personal computer of the personal co

In recording mode, you can save a vitace of a live performance on one of the 32 tracks that Personal Composer can hold in the computer's memory. After you've dubbed one or more tracks, you convert them into nection by indicating the key and time signatures and selecting Graphics from the recording mode's menu. In a minute or so, you'l see—Io and behold—an edit-mode screen filled with freshly generated staffs and notes.

Within this computer-generated score, however, some strange errors sometimes show up. Notes from different tracks might seem to have been cast onto staffs in random order. A reckless stack to legit lines might be used in an attempt to fit a moledy onto a bass clef staff. Separate notes of a melody might be clumped together. The tones in a block chord notes of a melody might be trangented, with flag-heavy rest signs seattened amone the notes. This sirk of the staff of t

way you imagined the music would look when you played it!

The problem is that music performed by a human contains many more nuances than can be noted on paper. Timings and lengths of notes vary subtly from one performance to the next. It's asking a lot of a computer to record a performance precise—by—yet only in as much detail as a score normally includes. If the finer details aren't filtered out, the resulting notation is more likely to confuse than guide a performer.

Personal Composer's notation comes closer to the mark if you use the settings

■ Converting a musician's performance into notation is far trickier than turning notation into sound

that most closely round off note lengths to a specified minimum value—usually a 16th note—before converting recorded tracks into notation. It also helps to may proper settings on the channels screen, assigning MIDI channels to the desired staffs. But since you need to anticipate so many variables, predictable results come only after much experimentation.

RECORDING If you are using Personal Composer only to record tracks and deal with them in non-notated form, you'll find the user interface more cumbersome and less informative than those of most other sequence; programs. The recording mode screen doesn't give much detail about each mode, and the channel assignment or other default values for already-recorded trucks unless you made a point of writing that value into the track data columns at the top of the screen.

Unlike the two-character keyboard commands used by the editing mode, Personal Composer's recording mode requires you to move the cursor onto a command or data item before you deal with it.

#### MIDI COMPATIBLES

Working with MIDI compatibles lets musicians and composers concentrate on artistic effects without worrying about technical details.

A well-implemented MIDI-compainble product should shield users from most of the technical details of MIDI interfacing, clearing the way for them to work in terms of the 16 MIDI channels, that link musical input and output devices. These channels are just like the channels on a tape recorder or a sound mixing board.

There are myriad devices that the computer can deal with through a MIDI interface for live performance or in a recording studio. Most current models of keyboard synthesizers-made by Casio. Kurzweil, Oberheim, Roland, Yamaha, and others-are MIDI compatible. Newer, more compact and economical synthesizers like the Yamaha TX-7 are being designed without keyboards because they can now be controlled by other devices in a MIDI system. There's also a whole range of specialized synthesizers such as drum machines, bass boxes, and sound samplers. MIDI input devices include keyboards, drum pads, breath controllers, foot pedals, and various styles of "MIDI guitars." In a recording studio, filters, delays, and other effects can be controlled and adjusted automatically in the MIDI operation.

Even acoustic instruments can be part of a MIDI system. A system called the Pitchrider (available from Cherry Lane Technologies) converts the playing of a single-line instrument, such as a saxophone, into MIDI information. One company advertises that accordions can

This arrangement is convenient only if you use a mouse. Another problem is that you can't select specific tracks to listen to without changing channel assignments. Most other sequencers let you matte tracks temporarily without changing the configura-

Personal Composer shines at the simple task of allowing you to write and edit

be converted into MIDI input devices.

MIDI instrumentation can also be used to coordinate musical devices with a video or film-editing system. This ability facilitates synchronization when you are recording a soundtrack and gives you greater control over the timing of music while you are composing and after. Even stage lighting systems have been controlled through MIDI channels.

MEETING MIDI HALFWAY Most computers don't have a built in MIDI interface (the Atari 520KT) is an exception, but one can be added to a side inside the IBM PC. The most widely used interface in the MIDI interface for the IBM PC. The most widely used interface on an fir as a short date and be called to an external Roland MPU-401 connection on fir as a short wide and MPU-401 connection. On the MIDI interfaces for the IBM PC are available (including one from Cave Plateau), but Roland's hardware is a de facto standard. All the software reviewed here can the used with the Roland

The Roland MPU-401 is a box the zero of apeptacks book with sockets for one MIDI IN (to send information to the computer), two MIDI OUTS computers, two MIDI OUTS computers (the computer can control two instruments directly)s, and one MIDI THRU HE MPU-401 has a buile in metroome; the MPU-401 has a buile in metroome; the unit iself produces an audible tick that can guide your playing. The interface also can be controlled by timing signals from an external synchronizing device—James Langdell

music on-screen before printing it out or playing it through a synthesizer. Considered solely as a program for storing and manipulating tracks recorded from MIDI instruments, Personal Composer is only OK, and the program's inconsistent integration between recording and notating modes can turn a more ambitious recording and editing revolves the project of the proje

seems that interacting with MIDI instruments with ease and handling traditional music notation are mutually exclusive talents—at least until more mature software turns computer-generated musical notation into an everyday miracle.

#### MIDI ENSEMBLE

MIDI Ensemble, like Sequencer Plus, presents its finest musical details in a pianoroll format. Most of the differences between the two programs involve finer points concerning the user interface. A musician choosing between these two programs has a plight similar to that of a pianist choosing between a Baldwin and a Steinway grand piano.

Sight & Sound adopted an unusual form of software protection for its protection for grand itsia so you want, but the software can run only on a system in which you've've can run only on a system in which you've've to the cabbe between the computer and the Rodand MPU-4D. This 2-in-th-only This 2-in-th-only in the protection for the protection of the protection of

music software that uses the MPU-401.

Before you can run the MIDI Exembleprogram, you must first configure it act up program asks you questions about your hardware configuration, display options such as screen color, and musical default values. This configuration procedure is easier to use than most because you can more freely through the options. Are to only at the stage, such as choof parameters, might be more conveniently adjustable from within the program.

SIX-OFTION MENU MIDI Entemble starts up with a six-item menu. Here you'll find options for Recording, the Event Bifort, the Phrase Editor, a Directory, a Text Page, or to Return to DOS. You choose from these items by moving the highlighted cursor and pressing Return, or by just typing your selection's initial letter. This menu gives you the first evidence of MIDI Enzemble's bandy command structure, which tusually offers several ways to do any task.

In the Recording mode, you have up to 256 tracks of music at your disposal, of which 8 can be played back at a time. The main benefit of this huge track capacity is the freedom it gives you to hold onto a lot of different takes and fragments while editing a composition.

Two cand divide the Recording mode's screen into windows, allowing you to monitor many musical factors at a glance. In the console window, basic information for 16 tracks can appear at one time. The cunsor and function keys move you fluently among these tracks so that you can specify which you want to record on, play back, or mue. If you ask to record on a track that alterally contains music, the program automatically assumes you want to "punch in," or record, over only purch prompts. There's no looping capability, however.

The console window also lets you make immediate changes in each track's channel assignment and pitch transposition. You can't, however, indicate voice program changes for each channel, as you can with Sequencer Plus's basic track table.

MIDI Ensemble lets you indicate lengths of tracks and punch-inse either in standard measure and beat units or in clock time and frames—more suitable when synchronizing soundracks for film and videotage. You can specify three tempos that can be called up at a keysthock during recording or playback of music. During playback, function keys let you mark the beginning and end of a phrase to be dealt with later in the Phrase Editor.

In its Event Editor, MIDI Extended displays notes in pinn-roll format. As forquencer Plast, each screen displays one measure's worth of notes from a forester plast, each screen displays one measure's worth of notes from a festive pitch track, MIDI Extended, however, represents pitches with thinner lines—sents pitch range on a single screen. This greater detail is only which this mode alone requires. (Senter pinches dapter, er Plast uses coanser, monochrome-compatible character graphics.)

As you move the cursor within a measure, it hops in rhythinic order from note to note (or chord to chord), sounding each pitch it lands on. You can ask the Event Editor to show you the cursor-touched notes in two other ways: with noteheads on a musical staff or as dots on a piano keyboard displayed at the bottom of the screen. These two visual aids can be dis-



The recording screen of Midi Ensemble lets you record up to 256 tracks in any given song. Only 8 tracks, however, can be played back at a time.

played concurrently, but they cover over the function key command menu and much of the status information that would otherwise be visible.

EDITING OPTIONS Once you memorize a few editing commands, which are described on a separate screen, you should find it easy to manipulate individual notes. You can insert new pitches of a preset length; the currently available rhythmic unit is set by cycling through the choices disolaved in that item on the status line.

The displayed measure is then sliced into his note length by a superimposed grid.

You can delete an existing note or you can delete an existing note or you move the cursor onto the note and grab it by pressing the Enter key. You then use the cursor keys in different modes to move it to another picto or position. You can the cursor keys in different modes to move it to another picto or position. You can return the MDID counts—the smallest time measurement in the MDID language. The Event Editor, however, doesn't seem to have an example of the counts—the counts—the counts—the counts—the counts—the counts—the counts—the smallest time measurement in the MDID language. The Event Editor, however, doesn't seem to have an example of the counts—the counts of the counts—the counts of the counts—the counts of the counts—the counts—the

the original note.

The Event Editor also allows you to view and change certain other types of MIDI data besides the notes themselves. You can deal with program changes, which tell a synthesizer to switch to another voice, or you can change the channel as-

signment in the middle of a track. If the music was originally input with a touch ensitive keyboutl, you can see the velocity data for each note and can change this force, and the control of the control though MID Tearmhle is alto to record just about any type of MIDI data on its tracks, it doesn't offer you a way to do detailed editing of input from such devices as sitch-bend wheeks and sustain needlas.

In the Event Editor, you can insert phrase markers in a track or move markers that were already placed in the Recording mode. Such phrases can be called on and manipulated later in the Phrase Editor.

■ MIDI Ensemble lets you indicate lengths of tracks either in standard measure and beat units or in clock time and frames.

TURNING A PHRASE In that mode, you'll see a list of available phrases at the top of the screen. Below that is a line chart showing each phrase's position in the song. In this editing mode, you can slice other phrases from tracks and delete, duplicate, reosition, or merge them.

This is the most confusing part of MIDI Ensemble: the screen layout doesn't seem to give you a clear perspective on relationships between portions of the music and the whole song. Cherry Lane's Texture, for example, has a much clearer arrangement for dealing with phrases in isolation.

Within the Phrase Editor, you can use an Autocorrect function to even up the rhythm in a phrase. It repositions each note onto fixed subdivisions of the metronomic beat. By making such changes at the phrase level, you can leave other musical passages on a track in a freer rhythm if you wish.

One thoughtful feature put into MIDI Ensemble is its Text Page, a single screen for associating freeform text and graphics

symbols with each song. On this page, you can write working notes, lyrics, and instructions on how to set up MIDI instruents for playing the composition, or attach a copyright notice to the music.

MIDI Ensemble's manual is organized around clear explanations of cach command and individual option that appears in the course of the program. However, the manual does not have a tutorial that might make clearer how these commands can be used in context to produce specific musical results. On that ground, I was more inconsected by the manual for Sequencer Plus.

MIDI Ensemble might be the product of choice for some categories of special users; for example, it lets you select time units that are more appropriate for video and film recording. In general, though, I've been too spoiled by Sequencer Plus to appreciate just how good MIDI Ensemble is. The two offer similar features at an identical price, and both make very effective use of player-piano notation (even a sheet-music mayen like me is beginning to consider that format the most suitable way to display music on a PC). If you're in the market for a sequencer with a huge storeage capacity, both these programs are worth a look.

#### MUSIC PROCESSING SYSTEM

Roland's program, Music Processing System, like Personal Composer, displays and prints recorded music in traditional notes-on-staff notation. The trouble is, it doesn't do this very well.

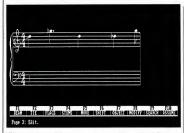
MPS is divided into three main modes; song, score, and print. In song mode, you can record and play back eight tracks and manufact groups of measures. In second mode, you can convert recorded privaces into staff notation or input notes directly onto the screen. Print mode, as you might assume, is where you organize individual measures into a page of music, which can then be printed out in this higher-resolution format.

One given limitation is that MPS is designed to use IBM's standard high-resolution mode, so this program has far less detail available than Personal Composer. That program insists on a Hercules monochrome erabnics board, for what prove to



usic with film or videotape

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MPS's score mode screen displays one measure of music recorded on a single track. The horizontal placement of notes determines their rhythm.

be good reasons. It's able to display about half a printed page of music on a monochrome screen, while MPS can handle only a single two-staff measure at a time.

MPS allows you to work with only eight macks at a time. Additional tracks could be stored in separate disk files or merged to clear some space. But this is the lowest track ceiling found in any of these programs. Perhaps Roland restricted its software to match the limit of eight tracks that its own MIDI hardware cantransmit at a time?

Another problem that constrains MPS is its cumbersome and inconsistent commands are entered through the function keys, whose purposes change from one mode—or even one keystroke—to the next. The program offers fittle potential for learning to operate it faster as you gain experience.

Some function key operations must be followed by pressing Enter, after others you must hit the Space har, still others are attached to submenus that you exit by hitting Esc. In the song mode, you play back the tracks by pressing the PgD or PgDn be keys until you reach the right command menu, then press F2 followed by the Space bar. In score mode, however, you hit F1 twice to start loadwack.

SONG MODE. Song mode is where most of the real shares wide, that represent that quantity of measures. If you want to that quantity of measures. If you want to see the rest of a longer composition, you want to the same must use a command to specify a different starting measure for the display, the program is unable to scroll smoothly through an entite sone.

To record part of a track, you must first move the cursor onto the track line and measure space where you want the recording to start. Then press F1 to prime the system, followed hy the Space bar to begin and end the recording. Using another group of commands, you can specify a range of measures by their numbers.

Once you have recorded a bit of music, you have to remember to save it in memory by pressing the Ins key—an important task that the Music Processing System never prompts you to do while recording. When an excerpt is saved, the measures it comprises are disolayed as filled-in blocks on

In song mode, you can manipulate existing tracks by marking and "picking up" one phrase at a time, then copying it onto another track or starting measure. You could, for example, produce a round by recording the melody on one track, picking it up as a phrase, and inserting it at properly staggered starting measures on other tracks. These phrase-level functions work fairly well, but the process is hampered somewhat because the screen includes no scale for identifying measure numbers and because the curror drisappears while it moves through a solid line of recorded measures.

SCORE MODE A phrase can also be carried over from song mode into score mode. A notated score can be made only from a portion of recorded music that has been defined as a phrase (not a multitrack song). Before formatting the phrase into a screen of "raw" notation, you must first use commands to specify three basic elements: meter, key signature, and minimum note value.

The last factor has a strong influence on the way the notation turns out. Although MPS produces notes that resemble the most that masked means that it doesn't deal look at a sequence of notes and rests in a board of the means of the strange of th



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#### At last! - Fast, On-screen **FLOWCHARTS**

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in terms of rhythm; they can only be used cosmetically when writing a score. Some acts of score editing can change the way a recorded track sounds; other changes only contribute to making a printed page of music look tidier in print mode.

PRINT MODE in print mode, you can deal only with score files that were saved in a high-resolution format. As is typical of MPS, when moving from score mode to print mode you aren't prompted to save your latest score in that format, if you haven't done so on your own initiative.

#### Roland's Music Processing System allows you to work with only eight tracks at a time.

sorry---your score is gone.

When you reach print mode with the right files, you must assemble each page to be printed, inserting one measure at a time. A page can contain four two-staff piano scores with six measures per line, at most. (This means, for instance, that in 4/4 time with 16th-note resolution, only two measures would fit on each line.)

When a single page is ready to print, it's held in a high-resolution file larger than 80,000 bytes. On an Epson LX-90 printer, it took 6 minutes to print each draft-quality

Compared to MPS, Personal Composer software, despite its own shortcomings, is far more facile at bridging the gap between modern synthesizers and traditional music notation. If you want to produce human-readable scores, it's a far better choice than MPS, even if you must invest in a Hercules board. And any of the other programs give you better tools for less challenging MIDI recording, sequencing, and phrase-editing tasks. Roland's software, sadly, doesn't live up to its musical hardware

James Langdell is a contributing editor of PC Magazine.

essor that knows about tlowcharts and organization charts - not just another 'screen draw' program that makes you do most of the work.

Interactive EasyFlow is a powerful tull-screen graphics program dedicated to tlowcharts and organization charts. With this program you can quickly compose charts on the screen. More important, you can easily modify charts so they are always up to date.

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Finally! An on-screen flowchart proc- printers, not just dot matrix printers. Wide charts can be printed in strips Also works with Hewlett-Packard 7475A (and compatible) plotters . Twenty standard flowcharting shapes included . Common shapes supplied in three sizes · Extensive manual (125 pages) includes many examples . Context sensitive "help" facility provides immediate assistance at any time . Any number of titles can be placed on a chart · Commentary text blocks can be placed anywhere in the chart . Fast: written in 8088 assembler . Plus many more teatures than we can mention

> Requires at least 256K memory, DOS-2 or higher and an IBM or Hercules compatible graphics card.

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The sample screen display shown below is typical of what you see while editing a chart. Other screen displays are provided for entering titles, changing cotions, getting "help" and so on.



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# THE REPAIRS

Playing the PC repairs game may never be fun, but today the odds are more with you than against you-if you

know the rules and play strategically.

**GAME** 

ack your system unit. Go to the post office. Mail the unit to the manufacturer. Do not pass GO until you rent another unit

Make a phone call. Open the door and greet the renairman, Exchange a monitor, Pass GO. You're back in business.

Drive to your dealer. Drop off the printer. Do not pass GO, Wait 3 days, Pay \$200.

Fortunately, these moves are just a few of the choices you can make in the higgest game in town-PC repairs. More moves and more players than ever before are involved in more versions of the game. The stakes are still high, but no one has a monopoly on the right choices, and there's no one way to win

Repair vendors are bankrolling profits like the owner of Boardwalk and Park Place, and repair services have been proliferating faster than imitations of Trivial Pursuit and spin-offs of Scrabble. When it comes to repairing your business's faulty hardware, more puzzling choices than those in Dungeons and Dragons confront you. But finding your way out of the maze is no fantasy-if you know the rules and have a winning strategy at hand.

A few years ago if you had a mix of equipment-an IBM PC, an NEC printer, a Haves modem, and other manufacturers' peripherals at home and Wang word processors, IBM PCs, and DEC minis in the office-you were strand-



ed when trying to find someone to fix you up when things broke down. No one was ready to play the game: Fast, reliable repairs without a service contract were just a phantom of your imagination.

KEY PLAYERS Today's repair market, however, includes an impressive but puzzling array of maintenance and service vendors equipped to repair a mixed bag of hardware: manufacturers like IBM, dealer/distributors like ComputerLand, third-party maintenance vendors like Sorbus (TPMs for short; they're third in line to offer you service, after the manufacturer and the dealer), franchises like Computer Doctor, and a growing number of local independent repairers. In addition, some corporations whose business depends on computers, like Travelers Corp., have in-house maintenance and repair centers

With all these service vendors now in the

game, the scenario in which no one is equipped to come to your rescue is now as outdated as Old Maid. With a service contract from a vendor, which is essentially a casualty and life insurance policy on your equipment, you have the choice of (in descending order of cost) on-site service with a number of available response times, pick-up service, carry-in service, overnight parts exchange, and mail-in service. Without a contract you pay for what is called Time and Materials (T&M) service. And more and more companies-national and local-are getting into the maintenance and repair business. Some repair vendors offer service on a contract basis only, a few handle T&M repairs only, but more and more do both contract and T&M

Yet the specter of broken equipment, halted operations, and frightening repair bills still keeps most users frozen on square one of the repairs game, afraid of what they may encounter ahead. Should you buy a service contract? If so, what type do you need and which company should you buy if from? If not, which service used should you call when you're in trouble? Choices like these terrify the most-experienced PC users. And that's even before the real torture—paying the bill.

THE BOOM "Service is the bread and butter of the competer industry," says Ron Shugan, director of International Data (Cop.'s (IDC) Customer Service Research Program in Framingham, Massachusetts. Editamiating the current market to be attentiating the current market to be about \$2.6 billion as pear, industry observers expect it to store 1 dout \$2.6 billion and \$2

IRD president Kenneth Bosomworth noses, however, that estimates of potential growth were about twice that high as recently as late 1944. Bosomworth sa recently as late 1944. Bosomworth sa recently as late 1944. Bosomworth so reported now nike expectations of growth not only because shipments of personal computers in the last year have been much lower than expected, but, more importantly, because shipment were perfectly as the president with the properties of the president same and the same and the same and test stime in the requir show, when

something goes wrong, users will be able to unplug, throw away, and replace chunks and modules of the equipment.

That's good news, but for now you still have the problem of how to get your present equipment up and running again. The problem is especially serious for business users, "Non Shagan emphasizes, time is usually the critical factor. How time, convenience, and cost. For businesses, time is usually the critical factor. How good the standard of the standard properties and you deliver your computers and you deliver your computers of the standard properties and you deliver your computers of the standard your flow in the standard your flow in the standard your flow in the standard your flow. The standard your flow is not love account he cause of eldow? If the you flow accounts because of delays? If

The specter of broken equipment, halted operations, and frightening repair bills keeps most users frozen on square one of the repairs game.

time is the most important consideration, service contracts that guarantee fast, onsite solutions—either from the manufacturer or from a national TPM—are probably in order. The questions for you then are which company should you buy the contract from and which kind of contract should you buy.

On the other hand, think again. What about cost? Service contracts can buy you sleep at night, but they'll tax your budget severely. You may have to work so hard and long to pay for one that you word have time to rest your weay) head. They average about \$2.000 a year for a basic person and warded equipment. In fact, Alfred and warded equipment, for the fact, Alfred \$0.000 for the payer and warded equipment. In fact, Alfred \$0.000 for the payer and warded equipment. In fact, Alfred \$0.000 for the payer and warded equipment. In fact, Alfred \$0.000 for the payer and pa

Convenience is another issue to consider when planning for service needs. With on-site service you circumvent the need to spend time and energy finding out where to take the broken equipment and then getting it there-not the most pleasant way to spend the day. So you may want to put out the money for a contract because you value convenience over cost. One repairs consultant says convenience really boils down to time: "If you're the only person available to take broken equipment in to the repair shop, and if your time is worth more per hour than the prorated cost of a contract, it pays to buy on-site service. A lawyer, say, whose billable rate is \$100 an hour would be crazy to spend his time standing in the repair line."

SERVICE FROM THE SOURCE Whether you decide to contract for service or take your chances and go for T&M service, you still must decide where you want to take your repair business. First in line are manufacturers, like IBM and Tandy (through Radio Shack outlets), which earn about half of the total microcomputer repair dollars. According to many analysts, the manufacturer is the best place to get reliable service, since its people know and care about the equipment and are more likely to have quicker access to parts. If your hardware is primarily from one maker, the manufacturer may be the best choice. If you've got an IBM system. you'll probably want IBM replacement parts. Keep in mind, though, that manufacturers' rates for service contracts are usually high.

Despite competition from more and more hungry TPMs, manufacturers are still winning service contracts from big business. Companies that own thousands of word processing workstations, automated teller machines, and terminals for backoffice operations-like Citicorp, Chase Manhattan, and American Express Corp .- are sticking for the most part with service from the manufacturers of their equipment. Chase, for example, has 150 data centers around the world and 200 word processing centers with a mix of IBM, Wang, and DEC equipment. The bank is sticking with manufacturers' service because, according to the vice president of telecommunications strategies,



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DIRCLE 601 ON READER SERVICE CARD

Time, not cost, is the most important consideration for this type of business, which moves money, selfs securities, and negotiates deals around the clock. Shear-sont Lehman Brothers' investment banking division, for example, recently signed a contract with Wang to maintain and service its 57 to 58 million plus worth of new Wang equipment, with special provisions for after-hours and weekend on-site service.

Manufacturers previously refused to service mixed equipment from other vendors. Now, attracted by the additional revenue the repair business brings in and alarmed by the new competition for that revenue, most service contracts of the major ones will cover various vendors' hardware if it's attached to the manufacturer's our. Be sure to sheek whether your peripherals are covered before you sign, though

Most manufacturers naturally prefer that you buy a service contract from them if your warranty is up (usually 90 days for parts and labor), not only because that means more revenue but also because of the added trouble and time involved if you have to return the machine to the factory. If you don't contract for on-site service, they generally advise you to bring the computer in to one of their local authorized service centers. Unless you live in a remote area and don't have a service center in reasonable proximity, shipping a bulky piece of hardware (especially without the factory cartons) can be more risky and troublesome than it's worth

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IBM offers a renewable 12 months of service under its annual maintenance agreement, with a range of options (availability depends on type of equipment). IBM On-Site Service, Customer On-Site Service, or Customer Carry-In-Service, "Mens you buy IBM On-Site Service, as-IBM service rep comes to you and either gives you an exchange printer or display,

which he connects after disconnecting the failing unit, or repairs your system or expansion unit. With Customer On-Site Service, which covers only printers and displays. IBM arranges to have a printer or display delivered to you in exchange for the failing unit, which you disconnect; you then connect the replacement yourself. Customer Carry-In Service means that you take your failing printer or display to the nearest IBM Service/Exchange Center during normal business hours and exchange it or, in the case of your system or expansion unit, take it in for renair: you can also send the unit in by mail or messenger and receive the replacement or the repaired unit by the same means. You can mix and match plans to tailor your coverage to your individual units. Prices range from \$24 per year for Customer Carry-In Service for an expansion card to \$653 per year for IBM On-Site Service for an XT system unit

Upping its ante in the repair market, IBM announced last August that it is offer-

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is final. Perums for repair require steen Proper, specifications & avails subject to change without heliole \$100 in purchase required. We do not get impact below. This add supersedes all visits but we were sent to the term. ing volume discounts of 15 to 25 percent for service on selected PC models and related products. At the same time, it expanded its service coverage from 9 to 31 non-IBM products used with IBM PC, including monitors, printers, modems, and feature cards.

SERVICE FROM YOUR DEALER Next in line for your service business is the dealer. If you have a mix of equipment you want repaired by one vendor, the dealer who sold the equipment to you (or a TPM) may be a better choice since some manufacturers still repair only their own or a limited range of other vendors' hardware. The dealer has a good chance of knowing the equipment you've got and how to repair it, but the wait for the necessary parts could take longer than with the manufacturer. Smaller businesses that choose T&M service may value the added convenience of having someone on staff take the defective hardware in to the local dealer rather than mail it off to a more distant manufacturer or TPM

Most dealers offer a range of service options, including contracts and T&M. Although dealers attract mostly small businesses and home users for service, some large companies are buying service from dealers also. In a surprising move, United Technologies Corp. (UTC) of Connecticut bought \$4 million worth of IBM equipment last year-not from IBM but from ComputerLand of Connecticut. The reason the dealer won the sale was service, according to John H. Bennet, corporate data processing director for UTC. Alarmed at the loss of business, IBM has begun to offer service for other vendors' equipment when attached to the PC and to market its service contracts more aggressively.

#### THIRD-PARTY MAINTENANCE

IHIGH-PARTY MAINTENANCE
TPMs, recently the liveliest segment of the
computer maintenance and repair market,
account for a growing percentage of the repair dollar. By some accounts they'll share
with dealers and independents in a 51 bililon silce of the market this year. TPMs
like the national organizations Sorbus,
TRW, Honeywell, GE, Control Data,
Western Union, RCA, Xerox.—every—
one's getting into the act—offer what Poor
describes as the "McDonald's approach to

repairs." Generally you know what to expect from them.

pect titin mem. TPMs are becoming the choice of some large corporations since they can offer volume buyers large discounts. The more equipment a company boys, the more TPM service. Travelers Corps, the Connectionbased insurance company, has an in-bouse service. Travelers Corps, the Connectionbased insurance company, has an in-bouse staff to maintain and service its over 20,000 small computers and 16 large mainframes; yet if periodically consistent contracting with a TPM to take over the jets, to after the preham't been right service.

Smaller systems may not be in a big enough league to take advantage of the money savings TPMs may offer. Rates can be high for individual contractors, especially for premium on-site service, since

 Computer repairs usually involve replacement of components, not really repair: the "repairer" simply pulls out the faulty component and replaces it.

you're subsidizing, in effect, the overhead of a national organization. The advantage is that you can have far-flung sites or move around the country and still find service. Computer repairs usually involve replacement of components, not really repair: the "repairer" pulls out the faulty component and replaces it. Like most computer repair services, TPMs are set up to swap boards; you may pay for more parts this way, but the labor costs are less than if the repairer took the time to fix the component. One pitfall to watch for, though, is that the replacement board is often a remanufactured board that may have different ROM chips than the newer version of the board you had in the first place. Poor cites one client whose replacement board eventually caused mysterious crashes, resulting in more frustrating and nonproductive downtime.

Sorbus, a Bell Atlantic company, is the largest TPM and services more IBM hardware than any other TPM. It maintains and repairs mainframes, microcomputers, and related peripherals on-site and employs more than 1,500 technical-support personnel in its 180 key locations throughout the country. Sorbus's PC service contract options include on-site, carry-in, ship-in, or van pick-up/delivery agreements for parts and labor. You can also carry in or ship in equipment for repair without a contract, on a T&M basis. In 1982 Sorbus opened its first Sorbus Stations, over-the-counter, carry-in repair centers to take advantage of the hefty PC repair market.

LOCAL SERVICE SHOPS A new breed of computer repair services has entered the market to compete with manufacturers, dealers, and TPMs in the past few years. Business has been booming for carry-in PC renair vendors who base their services primarily on time and materials. The countrywide explosion of T&M repair shops is nowhere more evident than in the Washington, D.C., area, which ranks only second to San Francisco in the number of personal computers per capita. When Joellen Cassidy opened American Computer Repair Inc. in Arlington, Virginia, in 1983, her company was one of the first ever listed in the Yellow Pages under "Computer-Service and Repair." Only 2 years later more than 50 such listings appeared for the Washington area.

Some of these repair shops are franchise operations—Computer Doctor, Serviceland, and Computer Factory, for exampte. Others are mom-and-pop operations like Cassidy's service. You see them in every major metropolitan newspaper's classified listing these days. Scores for leighborhood computer repair shops are listed in the current New York City Yellow Pages.

rages.

The new retail repair chains are similar to car dealerships. No consistency is guaranteed from one store to another, and quality of service can change overnight if one repair person resigns and another is hired. If you find good sarvice from one, be sure to get the repairer's name and home phone number in case that person decides to leave

#### SECRET TEST OF THE REPAIRS GAME

PC Magazine's suspicious and pessimistic editors got their comeuppance when they found four tested repair centers

far more pleasant and competent than they expected.

We admit it: we were skeptical, pessimistic, jaded. Repair shops and services were not high on our list of trustworthy institutions.

But was everyone involved in repairs inept, inexperienced, unknowledgeable, or even dishonest? Were they all out to take unsuspecting PC owners—or at the very least to make PC users' work lives with the properties.

utterly miserable? We decided to run an informal testactually it was more like a trick. We deliberately rigged four PC disk drives by shorting out two of the pins on the connecting cable of each drive (the brainchild and handiwork of Charles Rodriguez, PC Magazine's staff technician). Then, incognito, three PC Magazine staffers took the PCs to four repair places, one a manufacturer's service center, one a national dealer, one a repair chain, and the last a local dealer. We asked for written diagnoses and estimates-what was wrong, how much it would cost. We told our unsuspecting victims only that the unit wouldn't boot.

We expected the worst: outrageous claims that the motherboard needed replacement, that the entire unit was damaged, that we'd have to spent hundreds on labor and parts and days waiting for a repaired disk office. We thought we'd encounter surly, semiliterate, even smelly regainmen who crouched behind dusty mergainmen who energing during the gam-snapping, hairsyray-derenhed receptionists with nary a nodding acquaintance with the PC.

Our jaded imaginations conjured up all sorts of atrocities: lipstick- and oilsmeared bills for outrageous sums; cash or only some arcane credit card accepted in payment; patience-defying waits in serpentine queues, lined up with the likes of the guests at the Mad Hatter's ten guestsyclerks waiting to ust off our heads like the Red Queen's henchment, circuitous, logic-defying dialogues with repairmen metamorphosed into the Cheshire Cat, weeks spent down a dark, dark rabbit hole, incommunicado with our PCs as they sat enshrouded in dust on the repair shop shelf, even more scary, the thought of having to pot the machine, like Humpty Dumpy, back together again when all the ling's hones and all the king's men wouldn't go near such a fair g... . . . exch borrows of our self-difficted trails.

■ To run an informal test, we rigged four PC disk drives by shorting out two pins on the connecting cable

of each drive.

In fact, executive editor Paul Somerson depicted many of these horses in real-life detail just over 2 years ago (PC' Maggiane, Volume 2). Bitca Somer is tioned here—previously unimagined levetoined here—previously unimagined levetoined here—previously unimagined levetoined here—previously unimagined leveles of ineprinted. As he said then, "Why I could tell you stories that would curf your cables, all death turn." Somerson is a repairs monitored of the first order, and so his words made a deep impression. But, as we momentarily forget, the past 2 coms worth of change. The repairs game, The repairs game, is not what it once was.

We admit it we seen wrong. The PC Mognitur tricksters all came back Mognitur tricksters all came back Mogniture tricksters all came back Mogniture tricksters all came back more dropping off the sick PCs impressed with the places Bely had taken them. They told of clean service centers and friendly, resouring clefts and repair technicians. The fees for determining the problem and estimating the cools ranged from \$29 to \$82.35. A few days later we had the time estimated costs for repairs, ranging from \$81.70 to \$153.99, and the diagnoses.

The surprise was that every place we took our "Procket" PCs, the technicians quickly discovered what was wrong and correctly diagnosed the problem, without adding on costs for additional repairs! were relieved and delighted to see how far the PC repairs business has come. (All flour places we took the PCs, passed the test, but a Computer Factory branch on Long Island and a Computer Doctor branch in Mathattan got especially high took his PC thers.) affil member who took his PC thers.)

Our good news about the results of this isst doesn't mean that you call this isst doesn't mean that you call down your guard against shody service. Hough, Remember cowaet emptor and all the advice that goes along with it researching the best available researching the best available resources, documenting the problem beforchand, getting all estimates in wheel instituted consumer. Good Per pairers can become even better ones if you keep them on their toes.

We certainly missed the mark when we prejudged all PC repairers as incompetent, overpriced—even crooked. We've had to reevaluate some of our outdated, perhaps insular, biases. But sometimes it's nice to be wrong.—Carol Olsen Day's for another job or to go into business solo. As with car repairs, it pays to get to know your Mr. Fix-lt.

Independent computer repairers are taking part in the boom too. They may work out of their homes, a small office, or share space with other small service businesses. Some of the best independent repairers work days for manufacturers or the larger repair services and moonlight. You may hear of them most frequently through word of mouth. Wherever you get service. the repair person who actually does the work is usually the most important element and what determines its success or failure. So keep on a constant lookout; ask everyone you come in contact with who might know someone. Your queries and vigilance can pay off in more reliable, faster, or less costly service.

IN HOUSE REPAIRS. Another service option for businesses is to hire an in-house maintenance and repair person or, if volume demands, an entire staff like that of Travelers Corp. With its large mix of equipment (expected to grow to 25,000 PC units by 1990). Travelers has found that handling most repairs in-house is less expensive. Thomas M. Ottman, vice president of data processing, estimating on the conservative side, says Travelers' inhouse staff can handle the job for about \$75 per machine per year, while TPMs Travelers has consulted quote a cost of about \$350 to \$500 per machine per year. Ottman claims his unit can handle the iob better, with faster turnaround, more individualized attention, and most importantly, more flexibility than any TPM. The dollars Travelers saves this way each year, Ottman says, mean that it can invest in more PCs to serve its in-house customers hetter.

In-house service is less practical for comparies with units spread out across the country, but it can pay off, even for companies much smaller than Travelers. IDC's Shugan says that to get the benefits from an in-house service, you should have a least 100 units of equipment. (One example of that size operation handling PC repairs with its own in-house technician is The Johns Hopkins University Department of Medicine Oncodogy Center in Bultimore? Shugan advises that you analyze your?

pair costs. How much did you spend on labor list year? What did you pp cut for service contract? He claims you could find a good technical person for your staff andor option would be to hire someon gartime or to share a repair person with another company that has a similar need. (Remember though that you! Have to spend some time managing in-house repair, as with any employee unit.)

In-house repair has its own set of problems. When you're but one small user in a large company that relies on in-house repair, you may find yourself wondering if going outside the company for service isn't a better idea, especially when you find yourself last in a long line of people requesting repair service. You might have to

 Wherever you get service, the person who actually does the work is usually the single most important element in determining the work's success or failure.

cultivate a good relationship with the support team to call on in case of an emergency. Favored "customers" may be able to bump those ahead of them in the service

See Type Tweeter Streeters by a small mount of equipment, consider the money you'd save by becoming your own in-house expert. Ow what about encouraging a current employee to take on the repair mental "I you or sometiment "I you or send the property of the street," I you still you will be the property of the street, and repairing your equipment. Books like The Complete Computer Ministerance Handbook by David Bellin (Happet & Row, 1980), The Philis English Beechhold (Simon & Schuster, 1985), and

Repair and Maintenance of Your IBM PC by Gene B. Williams (Chilton Book Co., 1984) can explain the basics and get you started. Courses at local schools and community colleges are worth exploring, too (the instructors also can be a good source for finding out about people and places who can do reliable repairs).

GAME PLAN: KNOW THISELF With more and more people ready to take your money to do the job and more and more options for kinds of service, how do you cot of it; you've got to do your homework. First, Next to prevention (which PC Magazine will cover in an upcoming issue), planning is the most important step to make sure you get the best service for your time and money.

As in any endeavor, when planning for the worst—hardware breakdown—Shakespeare's advice holds up once again: "To thine own self be true." How well do you know your needs and your resources? Find your solution by analyzing your demands. Ask yourself:

- How much and what type of equipment do I have?
   How long have I had it?
- How long have I had it?
   What applications do I perform? How
- dependent on time is their completion and success?
- How long can I afford to have equipment out of order?
   How adept am I at preventive mainte-
- nance and do-it-yourself-type repairs?

  How accessible is stand-in equipment, either leased or borrowed?
- Service contracts are not the best buy for most small business and home users. But if your capityment is no longer covered by the manufacturer's warranty and your business cannot afford downtime for 2 to 3 days, you should have either a service contract with a reliable vendor or the services of in-house repair unless you have backup equipment available. For example, as Afford 1 to 3 to 3 year, "If you've pot a single ofference of the proposition of the proposition of the cation like getting out the payvoll for a kip company, with no parallel system to ham-

dle the job in an emergency and a relatively

small time window, then you can justify

the cost of on-site turnaround offered by a

service contract "

INFANT MORTALITY Most equipment that's going to fail will do so in the first 90 days of its use. Bosomworth calls this type of failure "infant mortality." So make sure that you use your newly purchased equipment right away. Keep it on for hours at a time, even overnight, and use it to the fullest so that if, for example, as Poor says, "the chips are going to burn out, they burn out before the warranty is up." David Bellin, author of The Complete Computer Maintenance Handbook, concurs: "After the first 6 months, the odds will be on your side if the contract is dropped." Bosomworth advises that if you can tolerate 2 to 3 days without the use of the hardware, a service contract won't be that useful to you over the first 11/2 years. After about 18 months, service contracts become more advisable if the hardware replacement costs are higher than the cost of the service, which, Poor says, ranges from 1/2 to

11/2 percent per month (some cite 12 to 20

Reep your new
machine on for hours. Use
it to the fullest so that if,
for example, the chips are
going to burn out, they
burn out before the
warranty is up.

percent a year) of the purchase price of the equipment, whether from manufacturers or TPMs. "Over a couple of years," Poor notes, "you could spend half again as much as the system." The additional reliability that munifications are building in to new hardware products makes it easier to forego the security blanket of the service contract. And Poor says that the fact that IBM is offering at full year of service in its warmany for the AT raises the user's confidence. ''If you're really worted about hardware failure from a financial rather than a time standpoint," the says, ''find out how much money you'd have to spend for the protection of a service contract. Then put it in the bank intend of in the vendor's pecket.

Printers are frequently mentioned as exceptions to the rule. They're notorious for problems, since unlike CPUs, they have many mechanical parts that can malfunction. So you want to purchase a service contact for any high-cost, high-demand printers you own and use the T&M approach for the rest of your equipment.



CHOOSING A CONTRACT If, after analyzing your need for fast turnaround and the convenience of a service contract. you decide you should purchase one, your next task will be to decide what kind of service you need. You can choose the premium on-site service (the repairer comes to you to do the repairs within a specified amount of time ranging from about 4 hours to 24 hours), pick-up service (the machine is picked up, taken to the shop and repaired, then returned to you), or carry-in service (you do the delivery and pick-up). Another alternative is mail-in service, which comes in two types: You identify

the problem, remove the offending component, and notify the vendor to send you a replacement component by overnight freight while repairing the broken one; or you mail your computer to the vendor for repair. Few experts, however, recommend this option because it requires expertise in diagnosing problems and takes too much time.

As with any contract, read the fine print carefully. Attorney L. J. Kutten (Computer Buyer's Protection Guide, Prentice-Hall, 1984) outlines some important con-

 See if you can figure out where your sick PC's problem is. If you can document what's wrong, you'll be better able to describe the problem to the repair people.



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siderations to be aware of before buying a service contract:

covered?

· When does the coverage begin-immediately or after the manufacturer's warran-

 What exactly does the contract cover? (As with all of the answers to these questions, be sure to get everything in writing.) Can you purchase the contract after you have had the equipment for awhile? If so,

do you have to bring it in for inspection at an additional cost · How much does the contract cost after

the first year? Can these prices be raised?

Can renewal be refused? If so, why?

· If you sell the equipment, is the buyer

 Must your entire system be covered? What if you add or delete hardware?

Will you be given a loaner if the equip-



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#### ■ REPAIRS

ment takes longer than a certain time for repair?

#### GETTING SERVICE ON YOUR OWN

If you've decided to bank the money a service contract costs and use it for the day when your own hardware actually fails, be sure to take a few precautionary steps before and while bringing the equipment into a repair shop. First, make sure the problem is actually the hardware and not your software or, frequently the case, what one repair technician calls "pilot error." Run through your connecting, booting, and startup procedures again. Try the diagnostics program. See if you can figure out by yourself where the problem is. If you can document what's wrong, you'll be better able to describe the problem to the repair people.

Bring all necessary cables and software related to the problem into the shop with the defective equipment. Even if you're sure they're okay, you want to be able to demonstrate the problem you've been having as accurately as possible.

And don't forget everything you know about good consumer practices like getting a written estimate first. You may also want to take the equipment to another shop for a second opinion (especially if you're not familiar with the work of the repair technicians you're consulting). Once you agree on what's to be done, be sure you know what the charges will be and how much time it should take. Ask if a loaner is available while your equipment is being repaired. Again, get all charges in writing.

In regard to loaners, it's a good idea to find out ahead of time where you can rent equipment when yours goes down. Call around and find out which company offers the best rates. Can you apply a percentage of the rental cost toward purchase of new equipment? Is there a price break for renting for a longer amount of time? What kind of credit do you need to rent equipment from various vendors? What's the payment arrangement? How much time elapses between making the call requesting a rental and receiving it? Does the rentat company charge for pick-up and delivery? Make arrangements ahead of time to ensure that you know the best place to rent replacement equipment and that you'll get the best service possible.

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# ■ REPAIRS

Wherever you go for exervice, get the best deal you can, and that doesn't always fromed, timely, and courtous service can be more valuable than low-cost service. The way one find out where to go for reputable service at reasonable cost? User groups, local bulletin boards, and repair course instructors can be good sources of recommendations. Also, ask computer stores, the computer stores that the contract of the computer stores that the conmend someone you can trust.

Until the day of completely disposable parts, computer repairs are a fact of life. Ever since William Butler Yeats wrote,

 Wherever you go for service, get the best deal you can—and that doesn't always mean the repairs with the lowest cost.

"Things fall apart; the center cannot hold," after World War I, people have been echoing his sentiments, especially about things mechanical.

So when it comes to repairs, let your motion be "Be Feprand". "Plan now so that you'll know whom to call on that inevitable day when something goes away. In sum: Step around, Look closely at any some step around, Look closely at any consense to the source of the source seeds of the sou

Carol Olsen Day's most recent book is The New Immigrants (Franklin Watts, 1985). She is an expert on corporate career strategies and has written extensively on that subject in books and magazines as well as for major corporations. Based in New York City, she also writes for television.



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# SOLOMON III SOPHISTICATED MULTIUSER ACCOUNTING

ver a year ago, in the January 22. 1985, issue of PC Magazine (Volume 4 Number 2), we reviewed the Solomon III single-user accounting system by TLB Inc. At that time we called it "the most sophisticated accounting software currently available for the PC." On November 4, 1985, TLB released multiuser Solomon III for use with Novell's NetWare/SM-2 (ARCNET) and NetWare/E (EtherLink) local area network operating systems. This new version provides for a sophisticated multiuser accounting system environment. Again, we believe, Solomon III sets the standard for personal computer accounting software.

With multiuser Solomon III, up to seven people can be signed on to an integrated accounting database using any of the Solomon III accounting modules. For example, seven individuals at a time can enter invoices into Accounts Receivable. Alternatively, they can all work in any of Solomon's 13 other accounting modules, including General Ledger, Accounts Payable, Purchasing, Order Entry, Inventory, Payroll, Job Costing, Fixed Assets, Sales Analysis, External Systems Interface, Database Reporter, Tutorial & Support Plan. or Address & Mail list. Record-locking facilities prevent any two users from updating the same record at the same time. System integrity is maintained to prevent, for example, two users from concurrently updating the record of the same vendor or posting to the General Ledger while financial statements are being prepared.

The operational or functional differences between single-user and multiuser Solomon III are minimal. In fact, if you are familiar with the single-user version, the transition to the multiuser version will be so painless as to be nearly unnoticeable.

64-MEGABYTE DATABASE Along with a new database format. Solomon III's maximum database size has been increased from 12.6 megabytes to a healthy 64 megabytes. However, TLB recommends that you not exceed 30 megabytes because system response time will suffer. This increase from a 12.6- to a 30-megabyte database makes Solomon III a reasonable alternative for a significant new group of users. We've begun to see sizable businesses choose Solomon III to address their financial accounting and reporting needs. However, we strongly recommend that, prior to purchasing this product, you get a certified Solomon III dealer to estimate the size of your database from your current and future (estimated) transaction vol-Homes

The multiuser version also provides for spooling of your printed output and offers the choice of printing to a system or local printer. Print spooling allows several users to send print-job requests to the system printer(s) at the same time. The file server processes these requests and stores the output file in a printer queue until the system orinter becomes available. You reasin



Once again, Solomon III sets the standard for PC accounting software with its multiuser version. It works with Novell's Netware/SM-2 and Netware/E LAN systems.

### ■ THE PRICE WATERHOUSE REPORT

control of the workstation as soon as the print job has been calculated and the output file created. There's no waiting for your print job (and any that may be in front of it on the queue) to conclude before getting back to work with the program.

The system's response to a request for printed material is: "Do you want to print to a system printer (Y.N)?" If you respond affirmatively, Solomon III prompts for the system printer number because you can have up to three system printers on a single file server. Once you enter the printer number, the program processes and spools the print job and returns control of your workstation to you. The Novell NetWare operating system allows you to run both serial and parallel printers from the same file server. Novell print spooling allows an individual user to control print requests from his own PC as needed. You can view print number, status, form type, job sequence, print filename, banner specification, number of copies, print format, and ioh print time at any time. Users can also cancel their own print jobs.

FREE E-MAIL Novell NetWare includes the Novell Electronic Mail System at no cost. You can set up the system so that when you log on, you are informed if you have received any electronic mail at the time. You can issue standard messages to all those who log on to the system based on predefined criteria. For example, if the system date is set to Monday, the system can display: "It is Monday, and your staff utilization report is due by 11 a.m." In addition, you can easily send messages from one workstation to another. These messages create an audible beep and appear at the bottom of the screen. They can be sent to one or many workstations, including the file server. This can certainly enhance intraoffice communications but may give the company controller nightmares. Sending a message from a workstation to the file server while logged into the Solomon III system will cause the database to crash. Fortunately, this can be avoided by disabling your file server's ability to receive messages when you power it up.

CONFIGURATION TLB is quite specific about its configuration requirements. You must use an IBM PC AT with 512K

 We've begun to see sizable businesses choose Solomon III to address their financial accounting and reporting needs.

bytes of RAM as a file server and DOS 3.0 (3.1 will be supported soon). Workstations may be any combination of IBM PC, XT, AT, Compaq, or Compaq Plus. Each workstation must have at least 384K bytes of RAM. You may use Novell NetWare/E (EtherLink), Version 4.61 or 4.61a, with 3COM EtherLink Interface Cards or Novell NetWare/SM-2 (ARCNET), Version 4.61 or 4.61a, with ARCNET PC-LAN Boards (Novell Advanced NetWare is due to be supported soon). If you use Net-Ware/SM-2, you will also need to purchase a "passive hub" (for up to three workstations) or an "active hub" (for four or more workstations). You need to use coaxial network cables to hook your file server and workstations together. Also, make sure you check your local building codes to determine if you need to use a special type of Teflon-sheathing. We did.

Of course, you'll need to purchase the multiuser Solomon III System Manager, the General Ledger module, and any other accounting modules you require.

System and local printers may be serial, parallel, or any combination of both. However, you should discuss this matter with your certified Novell dealer to assure proper configuration. In addition, we strongly recommend that you invest in a tape backup unit (see "Tape Backup: Measuring Speed and Cost per Megabyte," PC Magazine. Volume 5 Number 3). And, if your area is subject to electrical power fluctuations or outages, you should consider installing an uninterruptible power source (UPS) on the file server and each workstation. (Watch for upcoming reviews of power conditioning hardware in the May 27, 1986, issue of PC Magazine.)

Some of Novell's cabling limitations include a maximum of 100 feet from a passive hub to the file server or workstation, a maximum of 2 000 feet from an active bub. to the file server or workstation, and a maximum of 22,000 feet of cable in the total network. Again, you should discuss your planned configuration and its potential limitations with a certified Novell dealer.

TWO-STEP INSTALLATION The multiuser network installation involves two separate phases: installing the Novell network and installing the Solomon III multiuser system. Many of the accounting systems that we've reviewed in this series feature what we call "slam-dunk" I-hour installations. Just shove in the floppy and type INSTALL. Well, believe us-LANbased multiuser systems bring you into the big leagues. You've got to be prepared to do some considered planning. Get out

### The Price Waterhouse Team

G. William Dauphinais is a management consulting services partner in the Sacramenta,

Califarnia, office af Price Waterhouse and has long been a regular writer of and contributor to The Price

Waterhouse Report. Pat Fitzhenry is a management cansulting



services cansultant in Price Waterhause's Sacramenta office. His specialty is evaluating, selecting, and installing microcamputer accounting systems

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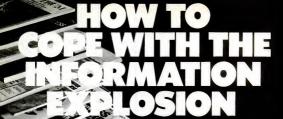
Solomon III (networked multiuser version) TLB Inc. Great Valley Corporate Center 257 Great Valley Pkwy. Malvem, PA 19355

(215) 644-3344. List Prices: System Manager, \$1,295; General Ledger, \$695; Accounts Payable, \$695; Accounts Payable, \$695; Fixed Assets, \$695; Inventory, \$695; Purchasing, \$595; Corler Entry, \$595; Sales Analysis, \$295; 506 Costing, \$995; Address & Mail List, \$195; Daiabbaxe Reporter, \$595; External Systems Interface, \$699; Tutorial & Support Plans, \$1499.

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should respond to the system's request with a "dummy" bad block (Novell recommends cylinder 38, head 2). In our first attempt, we entered no had blocks and encountered a bug in the Compsurf program, which made all further testing useless. The final tasks necessary to complete your network installation include running DOS's FDISK program and copying the NetWare programs onto the file server.

Once your file server installation is complete, you are ready to begin installing the Solomon III system. You must install all applications through a workstation. Boot disks need to be copied for each workstation from the NeWarer PE Doit disk, along with the AUTOEXEC.BAT file (tenamed from the SOLEXEC.BAT file on the SOLOMON III Install AUTOEXEC.BAT file on the SOLOMON III Install AUTOEXEC.BAT

Solomon III's automatic installation program offers the option of creating your own directories and DOS path environments or accepting the default settings provided. We found the default directories and subdirectories to be assistancely—ducing a potentially lengthy task into a I minute a fair. The installation program then prompts you to load the original Software of the program of the properties of the program of the properties of the applications modules you purchased now or load only the General Ledger and install the rest later.

The final installation task is to set up the network security privileges, as discussed below.

THE SYSTEM ADMINISTRATOR Installing a multiuser accounting system creates the need within your company or division for a new position with new responsibilities-the system administrator. The administrator is the individual responsible for completing tasks like powering up and down the system, setting up directories and network utility programs. and maintaining the computer security system. The system administrator's job has become necessary because the computer environment has become more sophisticated. For instance, you must start and stop database communications between the file server and the workstations whenever a database or log file backup is required. Database access numbers should be recorded and monitored in order to identify particular work performed and to maintain a clean audit trail. Single-user Solomon III creates log files by recording keystrokes; the multiuser system provides a more sophisticated log file, based on transactions. This type of log file should prove more reliable since it doesn't record erroneous keystrokes that can cause terrible problems during the reconstruction of a database.

Although the software allows multiple users to access the same database, you will occasionally be locked out of an operation because another user is currently undating the same record or group of records required by your operation. For example, you may have to wait if you attempt to print a report that contains a record being undated by another user. The system administrator should consider scheduling certain tasks in order to minimize this type of conflict. The Solomon system administration manual is very beloful in this regard, providing work schedule tables (by module) to show you which functions will cause delays if run concurrently.

SECURITY There are two security systems in place with the multisure version because both Novell and TLB provide their own security schemes. Novel, NewYear provides the system administrator with extensive facilities to create a security system as simple or as sophisticated as desired. Privileges can be granted to individual users or groups of users. These privileges include read, write, open, create, delete, search, and modify Using a

log-in password scheme, access to directo-

ries can be controlled, and through the se-

lective granting of privileges, user's ability to read, write, and so forth, can be limited. Once you have successfully logged not the Novell network, you must stign on to the Solomon III system. The multiuser version employs the same password protection scheme as the single-user version. Access can be controlled to the screen level by the sign-on password. For example, a sign on the former Ledger and have usees to the journal entry screen but be prohibited from orbiting financial records.

Both the Novell and Solomon security systems require that you set up a "master" user password. This is then the only password that provides access to the password maintenance function.

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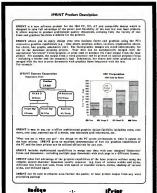
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DOCUMENTATION AND USER SUP-PORT At the same time TLB released Solomon III multiuser, the company introduced a new format for documentation for the single and multiuser Solomon III prod-

uct line. The new documentation consists of separate manuals for each accounting module plus a new module called The Solomon III System Manager. The new documentation is compatible with all current versions of Solomon III.

The one-book-per-module format is a big improvement over the old system, as the single binder for these capable systems was becoming unwieldy. TLB has expanded its coverage of each module and includes a "procedures" section for each module. The procedures addressed in these sections offer guidance on organizing your accounting paperwork to complement the Solomon III accounting software. Each procedure provides a step-by-step guide to the activity, detailing each step. with a recommendation as to who should perform each step, and to the Solomon III screens and reports involved.

The Solomon III System Manager module comes with two volumes: System Administration and Understanding Solomon. The Understanding Solomon manual contains general information needed for the operation of the Solomon III system and should be required reading for any new Solomon III user.

Other enhancements to the documentation include expanded coverage of screens and reports, appendixes on coding schemes relevant to the module, and an index in each manual.

Users of TLB's single-user system may purchase the new system's documentation for \$25 to \$35 per module for all modules except for the System Manager, which costs \$65. In addition, all users who have purchased modules since May 1, 1985, will be sent a technical bulletin detailing the new documentation. They will be able to order manuals for all modules they have unlocked plus the System Manager directly from TLB for a total cost of \$95

Also new is a forms disk. This disk can be used to print out the required forms for all modules. The forms replicate the data entry screens and should make your hard copy more useful and manageable.

TLB seems to recognize that, with the added sophistication and complexity of its multiuser version of Solomon, its success is dependent upon your dealer's knowledge and experience with LANs, particu-Jarly Novell's NetWare. Anyone wishing to become a Solomon III multiuser certified dealer must first provide TLB with proof of successful completion of both Novell NetWare and Solomon III multiuser required training courses. This is good



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news for accounting professionals who use personal computers.

"Teleconsultation" support from TLB is available to those who want to work directly with the developers of Solomon. To use this teleconsultation service, you must be a registered user of a Solomon product and have authorized TLB to bill your charge card at a standard \$72-per-hour rate, with a 5-minute minimum charge.

If you want to use Solomon III but need to have the software customized in certain minor ways (such as adopting a special invoice format, preparing custom reports, or changing field names on screens), TLB will contract with you to do so. To initiate this type of work, you must be a teleconsulting user and be willing to pay TLB for the time required to prepare the customization specification and contract, whether or not you then choose to have the company go ahead with the work.

TLB's customer education group offers courses such as "Using Solomon," a 2day training seminar. This seminar covers the General Ledger, Accounts Payable, Accounts Receivable, and Payroll modules in detail. Topics include system-wide installation procedures for single and multiuser Solomon, operational procedures, conversion guidelines, and optimal use of Solomon's features. The instruction is given by TLB branch managers and Solomon certified consultants.

CONVERSION FROM SINGLE-USER SYSTEMS Many of those interested in using multiuser Solomon may already be familiar with the Solomon III single-user system. (We were told that there are over 10,000 existing single-user installations.) To address the needs of those wishing to upgrade to the multiuser version, TLB created a utility program that converts a single-user database into a multiuser database. This program takes each record from your single-user database and converts and copies it into a multiuser database. You need enough hard disk space to hold both databases at the same time. Even though this function is automated, it takes some time. Plan on a 7-megabyte database taking about 3 days to convert. This process cannot be interrupted, so you may want to

run it over a weekend. TLB is offering current Solomon users dollar-for-dollar trade-in credit against the price of Solomon III multiuser. To upgrade, you must purchase these items from your dealer: the Solomon III System Manager/Novell module (\$1,295), the Solomon III Database Conversion Kit (Version X.12 for Novell, \$95), and manuals for all modules you wish to upgrade. You simply complete the forms found in the Database Conversion Kit and send them along with



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your original single-user disk to TLB. The company will send you the disks necessary to complete your system upgrade.

Such a conversion is not so easy for some Solomon III users. We've worked with businesses using two or more non-networked machines to run multiple Solomon III applications on an application-permachine basis. This allows you to use multiple machines as data-entry stations. This allows you to use multiple machines as data-entry stations consolidation function provides the means of pulling all this data together into a single General Ledger database.

If you are using this type of multiplemachine single-user system, your conversion to a multiuser system will be a greater burden. First, you will need to use the standard Solomon Database Conversion Kit to turn your General Ledger database into the multiuser format. That's easy enough. The problem is with the other modules that reside on separate PCs. You must manually convert data from your other modules, incorporating them into the multiuser database you have just created. At this writing, there is no utility for pulling data out of secondary machines for conversion into a separate multiuser database. We spoke with product managers at TLB about this problem, and they told us that they are currently working on a utility that will, at a minimum, allow nonfinancial master records to be transferred from secondary databases. When this becomes available, you would have to enter and tie out only the financial detail such as open payables vouchers and receivables invoices.

As with any such system, there are limitations that shouldn't be overlooked. First, only one database can be active on the file server at a time. This means that if one user is signed on to the production database, another user may not sign on to a test database for training or practice.

Second, the Solomon III installation instructions need to be improved. We found the instructions somewhat cumbersome, and some appeared to be out of sequence. The 33 pages of instructions could be replaced by 9 to 10 pages of required steps. We discussed this with representatives from TLB's support group, and they said they plan to issue such a document.

Our original review of Solomon III was very positive, and we remain impressed with the functionality packed into TLB's accounting modules. Now, with the company's multiuser option (and larger data capacity), these systems represent an alternative that a small business should not

overlook. We believe that many will find the benefits of multiuser concurrent processing to be worth the expense and effort.—G. William Dauphinais, Pat Fitzbenry, and Jeffrey Williams



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# CHOOSING AND USING MODEMS



Using the power of the near-universal AT command set and calling on little-used batch files are two simple tips to help you get the most from your modem.

Being able to communicate and to exchange information with other ly expand your productivity. While many users already understand the basics of hooking up modems and transferring data, the intricacies involved often trip up the newcomer.

Here's an overview of modem communications, with some hints for getting more out of your modem, including an easy way to call home with only a few keystrokes without an autodialer or modem program.

HAYES: THE DE FACTO STAN-DARD The Hayes Smartmodem is the de facto standard for moderns, and at 5599 list for the 1200 setternal it's true that you're purjug at kast partly for the name. Other pertuable makers include Microcom, Racal-Vadic, U.S., Robotics, and IBM. U.S. Robotics is the cheapest of the group (5449), IBM the constlient (5609), and Hayes the castes to get (less than 5400 discounted). Ven-Tel, Bizcomp, and Quide are also well-known names in the file.

Internal moderns cut \$50 to \$100 from the price of their external counterparts and often include communications software. The internal Hayes 1200B Smartmodem costs \$549 (with software); IBM's PC 1200 External Modern is \$599 (no software).

Too expensive? Hayes-compatible internals include models from Practical Peripherals, \$199. CTS, \$175; and PC's Limited, \$159. (CTS sells 2,400-bitsper-second internal or external modems for \$375.) None of these have yet been tested by PC Magazine Labs, but don't rule them out because of price. Moderns are pretty simple beasts. Do eheck the warranty, though. Hayes offers 2 years.

One specialty modern of interest is to external Promethers PromOdern 1200. If you add its optional communications buffer, the ProModern functions as an electrotic mailbox that will receive and send messages even when your computer is off ("Buffers That Boost Communications of Potential." PC Magazine. Voltagazine, Voltagazine, Voltagazine, Sumai susuel adds to nearly any modern a similar standalore capability for incoming

HAYES COMPATIBILITY The claim of 'Hayes compatibility' is a common source of confusion. You don't need a Hayes-brand modern to talk to another Hayes modern. You don't even need a Hayes-momentally modern. As long as they meet the electronic requirements im-

■ The Hayes "standard" is important because so much communications software uses the Hayes command set (also known as the AT command set). posed by the Bell 103, Bell 212, and V.22 bis protocols for 300-, 1,200-, and 2,400bps eommunications, respectively (see sidebar "Protocols")—and virtually all modems sold for PCs do—you're all set.

The Hayes "standard" is important because so much communications software uses the Hayes command set (also known as the AT command set). Even IBM uses it. It's not that the Hayes communications software is writen for it. Some programs also handle additional command

What is the AT set? Whenever you type a capital AT, a Hayes-compatible modern knows that what comes next is an instruction for the modern. For instance,

AT DT 1 202 456-1414 <Enter>

tells any Hayes-compatible modem to come to attention (AT), dial (D) using tone dialing (T), and call the White House.

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moderns are more compatible than othens. PC Labs benchmark tests have shown
a high degree of compatibility from Microcom, U.S. Robotics, IBM. Promethcus,
and OmniTel products, but even in this
group some moderns won't work with
some programs, so the best policy is to test
before buying.

Even modems with the full Hayes command set may have timing differences or other hidden incompatibilities. The best test is to try several communications packages and the autodial function in SideKick.

# ■ PC LAB NOTES

# Protocols

Word gets around—in the United States as well as abroad—by means of protocols.

In the United States and Canada, most PC moderns observe one of three protocols, which are defined in part by how fast they run. There is a second set of protocols for the rest of the world, called the CCITT protocols, recommended by the International Telegraph and Telephone Consultative Committee.

Bell 103 protocol for communication at 0 to 300 bits per second, about 0 to 30 characters per second. Although they're in a number of laptop portables, as standalones, these moderns are painfully slow for any but the most easual users. The contents of a single 360K floppy disk would take almost 2½ hours to transfer.

The CCITT counterpart 300-bps protocol is V.21 (pronounced Vee dot twenty-one). Bell 103-compatible modems absolutely cannot communicate with V.21 modems; the protocols are too different.

 Bell 212 protocol for 1,200 bps, about 120 characters per second. If you already own a modern, odds are it's Bell 212-compatible; that's the standard in the business world. They list for \$200 to \$600.

The European counterpart is V.22. Bell 212 modems in the United States can theoretically communicate with V.22 modems in Europe because the protocols are similar. In practice, there are often problems. The link is usually easier to establish if you're calling from this country. A handful of modems built since late 1985, most notably the Hayes 1200 and 1200B units, offer both proto-

 V.22 bis protocol for 2,400 bps, about 240 characters per second. This may be the modern of the near future (unless 2,400 bps is leapfrogged by 9,600bps moderns). For most users, this newer, more expensive "standard" isn't widespread enough to be worthwhile yet. Moderns in this category typically list anywhere from \$600 to \$900, and their best feature is the price pressure

If you trived overses, you cannot bring a Huges or other United States-approved modern with you and hook it up to the European phone lines—at least not legally, Just as moderns require Capproval in the United States before they can be used, so do they require equivalent approval in other countries. Canadian standards are similar to those bene, but in Canada also, modern require specific approval before they can be used.

they put on 1,200-bps modems.

SOFTWARE PROTOCOLS Another set of protocols helps ensure against errors during file transfers.

The public-domain Xmodem protocol is the most widespread and closest to being a standard. It's also known as the Christensen, CP/M User Group, or MO-DEM7 protocol. Most software packages include Xmodem.

Kermit is another public-domain protocol that is becoming more widespread. Many programs (Smartcom II and Crosstalk XVI, for example) offer propri-

Crosstalk XVI, for example) offer propretary protocols. These work only if you have the same program operating on both computers.

More-sophisticated protocols vying to become the new standard are MNP by Microcom and X.PC by Tymnet. The jury is out on which one—or both—will come out on top.—M. David Stone ing the phone, logging on to a system, asking for information, saving the information to disk, and logging off. Microsoft
Access, Relay Gold, ASCOM IV, and Microstuf's yet-to-be-released Crosstalk
Mark 4 lay claim to being a new generation
of communications software that offer
background file transfer.

Description for unastrolled as freeware (\$35 to the authors if you like the program and is the least you should demand in a communications program. Its features in-clude autodial from a built-in-plone directory, semiautomatic log-om with program-mable function keys, and error-correcting file-transfer capabilities using the wide-spread Xmodem protocol.

IBM includes with DOS a simple but workable communications program, COMM.BAS, that allows your PC to function as a dumb terminal. Using COMM.BAS you can issue commands to a smart modern, but you can't save anything to disk that you receive from another computer.

REMOTE OPERATIONS A new and growing category of commonications software is the remote-operations program, which lets you call your PC from elsewhere and run programs on your system. Programs include Remote (for calling from virtually any computer), pc ANVWHERE similar to Remote), and Carbon Copy (which is currently the best choice for calling PC to PC).

CONNECTIONS Connecting an internal modem to a PC is mostly a matter of plugging you had in smostly a matter of plugging you had in smooth a property of the property of the property of the promunications port. If cither COMI or COM2 is taken, simply assign the modem to the other COM port, usually by setting a DP switch on the modem board or by moving a small jumper connector on the board from one set of pins to another.

If the modem is the only communication device in your system, it doesn't natture which COM port it is set for, as long as you remember to set your software appropriately. Having the modem and another serial device set for the same port tow rid any damage to the system, but it will keep the modem from working. (This same consideration should be applied when you're

Try cut the modents with Crosstalk XVI.
Ountiern 2. Suartcont II. Relay. Relay
Gold. or Microsoft Access. When testing
for Hayes compatibility, install each program for a Hayes Suartmodem, then try
using the program's autodial leature to es-

tablish a connection. Unless the modern works with all the programs, it's not 100 percent compatible.

Relay, Microstul's Crosstalk XVI, and Hayes's Smarteon II handle unattended operations for such complex tasks as dialconnecting an external modem.)

control of the state of the sta

Usually, indeed, all you need is a cable with pins 2 and 3 for data plus line 7 (the signal ground) and possibly pin 1 (a protective chassis ground). Be aware, however, that some communications software—notably Crosstulk XVI—wants to see other pins connected. Thus the safest approach is to wire all 25 lines straight through.

pins connected. Thus the safest approach is to wire all 25 lines straight through. The PC AT uses a 9-pin DB-9 connector rather than a DB-25. The 9 pins are sufficient because most of the 25 lines in the DB-25 aren't used anyway. IBM and oth-

ers sell DB-9 to DB-25 converter cables.
You can buy a fully shielded (from interference) cable for about \$50. Any Radio Shack sells a nonshielded ribbon cable for \$20, or you can buy a ribbon cable and two connectors for a dollar or two less and press them posether.

CONNECTING TO THE PHONE LINE Most modems plug directly into a wall jack using the same miniature connector that a standard RJ-11 phone jack uses. Multiline phones that go through a switchboard may use RJ-12 or RJ-13 jacks. These look identical to the RJ-11 but have different wirns. Some modems can be set

for any of the three; others work only with the standard RJ-11.

Some modems have a second jack for the phone. If not, buy a two-way RJ-11 adapter at Radio Shack and plug both modem and phone into the telephone outlet.

MODEMS WITHOUT SOFTWARE
Most modem commands are given
through software, but you can also communicate with your modern directly from
DOS by using batch files or commands
copied from the keyboard (CON).

First step, initialize the communications port. From DOS, for a 1,200-bps modem, type

mode com1:1200 <Enter>

The MODE command sets the system to send data out the COM port. For the second port, substitute COM2. For a 300- or 2,400-bps modern, substitute 300 or 2400, respectively.

With the COM port set up, you can easily send information to the modern. One possible way is to dial your calls from DOS, in much the same way as you might de

use the autodialer in SideKick. To dial the phone number 123-4567, you would type the DOS command

echo ATDT 1234567 > coml: <Enter>

The greater-than (>) sign tells DOS to send the text to COM1. Smartmodern commands must be typed in all uppercase, but the modern doesn't have any trouble with spaces, parentheses, or hyphens. It interprets a comma as a 1-second pause to wait for an outside line.

If your phone is plugged into the modem, it's probably been switched out of the

# Checking Your Modem's Status

The lights are there to give you a message. Here's what they're telling you.

The most important advantage of an external modern is its bank of seven or eight status lights. They vary from one modern to the next, but the status lights on a Hayes 1200 are typical.

They are:

 AA (Auto Answer). This light indicates whether the modern is set to pick up the phone. Not all moderns have it. If Auto Answer is on, the modern answers the phone with a screech computers understand and people hate. (Shut off Auto Answer by typing AT SO=0 <= Enter>.)

 CD (Carrier Detect). This indicates when the modern is talking to another modern. When communications stall, a glance at the CD light indicates if you're still connected.

• Its Offigh Speed). This indicates operation at 1,200 bits per second. When sending a command to your Smartmodem, it gives you an immediate check on the speed for which your software is set. When answering a call, the modem automatically matches the speed of the incalling modern, the litch indicates if this

calling modem; the light indicates if this is 1.200 hps.

• MR (Modem Ready). Power-on light, indicating whether the modem is

on or off.

OH (Off Hook). OH lights up when the modern connects to the phone line. Some communications programs turn off

the modem speaker when a call is in progress; the light assures you something is happening. When the modem hangs up, the Off Hook light goes out.

 RD (Receive Data) and SD (Send Data). These two lights flicker (rather than glow) as information flows in or out of the modern. If the Send Data light doesn't flicker when you type on your keyboard, okds are good that your system has a problem. If it flickers but the other system has stopped echoing (making your RD) light flicker), the problem is on the other side.

If the Receive Data light is flickering and there is nothing showing up on your screen, you probably have a problem a problem at fit flickering, you know that the other side isn't sending. In most cases, you can deal with a problem on your side by leaving the problem on your side by leaving the program and then restarting it; most moderns let you do that without breaking the phone connection.

 TR (Terminal Ready). This indicates whether the modernthinks the computer is on and ready. One of the lines to the modem ripin 20 on the RS-232 connector) is known as Data Terminal Ready or DTR. If if s off (or "false"), the modem worl answer the phone even when set for auto-answer. Crosstalk XVI uses DTR.—M. David Stone

## PC LAB NOTES

circuit by the dialing command. To get the modem to hang up and resurrect the phone, type

echo ATH > com1: <Enter>

ATH tells the modem, "Attention, hang up."

BATCH DIALING FILES The one-time commands listed above are no faster than dialine yourself. You could hang up by flipping the on-off switch on the modern itself, but electrical circuitry is better left on once turned on.

Better than dialing from DOS is to put all this in a batch file. To create the batch file from the DOS prompt, type

copy con: dial.bat <Enter>

Then enter the body of the batch file: mode com1:1286 (Enter) echo ATDT %1 %2 %3 %4 %5 > com1:(Enter) pause (Inter) echo ATE > com1:(Enter) (CMI-E) (Enter)

Line 1 initializes the COM port. In line 2, the number you dial substitutes for the %1 %2 %3 %4 %5 parameters. You need one parameter for each block of numbers surrounded by a space. The most you'd

need would be five if you dialed long-distance, 91 (555) 123 4567. Unused parameters are ignored. Line 3 stops the file from going any further and tells you, "Strike a

key when ready . . . . " Once the modern finishes dialing, you pick up the phone, strike a key, and line 4 hangs up the modem. But since you have the phone in your hand, the connection isn't broken. Ctrl-Z <Enter> ends the batch file.

AT, PHONE HOME You can use similar batch files for other purposes. You could create HOME BAT to call home from work, which requires you to dial 9, nause (the comma pauses 1 second), then dial the number. Create the file as above (or use a word processor), then type

mode coml:1288 (Enter) echo ATDT 9, 123-4547 > coml:(Enter) pause (Enter) echo ATB > coml: (Enter)



### FACT FILE

# MODEMS

Smartmodem 1200 and 1200B Hayes Transet 1000 Hayes Microcomputer Products P.O. Boy 105203 Norcross, GA 30348 (404) 449-8791 List Price: 1200, \$599; 1200B. \$549; Transet 1000, \$399 In Short: Two modems that estab lish the standard in command sets. plus a communications buffer to

store in-coming messages. CIRCLE 681 ON READER SERVICE CARD Era 2 1200 and 2400

Microcom Inc. 1400A Providence Hwy. Norwood, MA 02062 (617) 762-9310 List Price: 1200, \$499; 2400, \$799 In Short: A 300/1,200-bps external Hayes-compatible modern and a 2,400-bps modem

CIRCLE 649 ON READER SERVICE CARD PC Modem/1200 Ven-Tel Half Card 2400 Ven-Tel Inc 2342 Walsh Ave. Santa Clara, CA 95051

bps operations

(408) 727-5721 List Price: 1200, \$499; 2400, \$695 for Smort: Two inti-shar markets cards, for 300/1,200-bps or 2,400-CIRCLE 641 ON READER SERVICE CARD

PC's Limited 300/1200 PC's Limited 1611 Headway Circle, Bldg. 3 Austin, TX 78754 (517) 339-6962 In Short: A half-card 300/1,200-bps

List Price: \$159

Haves-compatible modern. CIRCLE 652 ON READER SERVICE CARD Maxwell Modems Revol. Vadio 1525 McCarthy Blvd. Milpitas, CA 95035

(408) 946-2227 List Price: \$350 In Short: A series of 300- and 1,200bes standalone modems. CHOLE 643 ON READER SERVICE CARD

PC: IntelliModem Rizcomo 532 Mercury Dr Sunnyvale, CA 94086 (408) 733-7800 List Prices \$400 In Short: A 300/1,200-bps Hayes-

compatible external modern CROLE 653 ON READER SERVICE CARD Practical Modem 1200 Practical Peripherals 31245 La Baya Dr. Westlake Village, CA 91362

(818) 991-8200 List Price: \$199 In Short: A half-card internal 1,200bps Hayes-compatible modern OROLE 647 ON READER SERVICE CARD

CTS 1200 and 2400 CTS Corp. 905 North West Blvd

Elkhart, IN 46514 (219) 293-7511 List Price: 1200, \$295; 2400, \$395 In Short: 1,200- and 2,400-bos modems that are available in both halfcard and desktop configurations. Understands both the Haves and CTS command set CRCLE 648 ON READER SERVICE CARD

Prometheus ProModem 1200 Prometheus Products Inc. P.O. Box 4156 Fremont, CA 94539 (415) 490, 2370 List Price: \$495 In Short: A 300/1,200-bos Havescompatible modern with message-

storing buffer CIRCLE 645 ON READER SERVICE CARD Microlink 1200 (internal)/Password (external) Microlink 2400 Mode U.S. Robotics Inc.

8100 N. McCormick Blvd. Skokie, 1L 60076 (312) 982, 5001 List Price: 1200 (internal), \$449; Password, \$449; 2400, \$699 In Short: A full-length 2,400-bos modem board, a 1,200-bps internal assignationard, and a 1,200 bus external modern board CIRCLE 642 ON READER SERVICE CAPID

Encore 1200B OmniTel 3090 Oakmend Village Dr. Santa Clara, CA 95051

(408) 986-8236 List Price: \$399 In Short: A 300/1,200-bos Havescompatible modem on a plue-in

CIRCLE 648 ON READER SERVICE CARD

Oubié PC 212A/1200 Modern Qubié Distributing 4809 Calle Alto Camarillo, CA 93010 (805) 482-9829 (805) 482-9741

List Price: \$299 In Short: A low-cost 300/1,200-bps Hayes-compatible modern board, CRCLE 844 ON READER SERVICE CARD

IBM PC 1200 External Mod IBM PC 1200 Internal Modem IBM Information Systems Group 900 King St. Rye Brook, NY 10573 (800) 426-2468

(914) 934-4488 List Price: 1200 Internal, \$499; External, \$609 In Short: A 300/1,200-bos Haves-

compatible internal modern board and an external modern board CIFICLE 650 ON READER SERVICE CARD

Another useful file to add to your hard disk is NOANSWER BAT, which tells your modem not to autoanswer the phone. The SO register tell's a Hayes-compatible modem how many rings to allow before answering, and a value of 0 is equivalent to never.

Similarly, HANGUP.BAT hangs up the phone:

mode com1:1200 <Enter>
echo AT H > com1: <Enter>

These last two files save you from having to load up your communications program all over again if you've left and then noticed the autoanswer or off-hook lights were on.

PUTTING IT ALL TOGETHER Each batch file takes up 2K on your disk (4K if DOS 3.1). Here's a way to put everything on one file called AT. BAT:

mode coml:1288 (Enter)
opto \$1 (Anter)
echo ATDT 12 13 14 15 16 > coel: (Enter)
peuce (Enter)
echo ATE > comi: (Enter)
opto end (Enter)
(BOME (Enter)
node con1:12Bl (Enter)
echo ATOT 123-4567 > com1: (Enter>
pause (Enter)
echo ATE > comi: (Enter)
goto end (Enter)
: MCANSWER (Anter)
Pode conl:1200 (Enter)
echo AT 58+8 > comi: (Enter)

AMGUF (Enter) de coml:12EE (Snter) ho AT 8 > coml: (Enter) ND (Enter)

To use AT.BAT, you type AT, followed by the desired label—either DIAL. HOME, NOANSWER, or HANGUP. In the case of DIAL, you simply also type the desired phone number before you hit the Enter key.

The batch file gets to the second line, substitutes the typed label for J6, then follows the GOTO command to go to that point in the file. In the case of D1AL, it will substitute the phone number for %2.83.4% 55.86. Notice the GOTO END command at the end of each routine, and the END label at the end of the file. This will cause the file to skip over the parts that you don't want to use the file to skip over the parts that you don't want to use the file to skip over the parts that you don't want to use the file to skip over the parts that you don't want to use the file to skip over the parts that you don't want to use the file to skip over the parts that you don't want to use the file to skip over the parts that you don't want to the file file file.

You will probably find that using AT.BAT to its best advantage requires a few refinements.

You may prefer to put the MODE command line in your AUTOEXEC BAT, the file that DOS looks for and automatically



# FACT FILE

COMMUNICATIONS SOFTWARE

Smartcom II

Hayes Microcomputer Products P.O. Box 105203 Norcross, GA 30348 (404) 449-8791 List Price: 5149 Requires: 96K RAM, one disk drive, Hayes Smartmodem, DOS 1.1

or later.

In Short: A basic communications package with programmable macros.

ORGE 635 ON PEADER SERVICE CARD.

Crosstalk XVI Remote 1.2 Crosstalk Mark 4 Microstuf 1000 Holcomb Woods Pkwy. #440

Rowsell, GA 30076 (edd) 993: 399. List Price: Crosstalk XVI, \$195; Remore, \$195; Crosstalk Mark 4, \$285 Requires: Crosstalk XVI'-96K RAM, one disk drive, autonaswer modem, DOS 1, 1 or later, Remoter: 192K RAM, one disk drive, modem, DOS 2, or later. Crosstalk Mark 4: 256K RAM, one disk drive, autonaswer modem, DOS 2, or later.

In Short: Crosstalk XVI includes both a proprietary and the Xmodem protocol. Remote allows the user to control a PC from a remote location. Crosstalk Mark 4 features multiple windows, X.PC, and MNP proto-

COS.
CRICLE BASICN READERS ERWOL CARD

Relay

Relay

Relay Gold VM Personal Computing 6 Germantown Rd. Danbury, CT 06810-9990 (203) 798-3800 List Price: Relay Gald, \$225; Relay.

\$149
Requires: Both programs: 128K
RAM, one disk drive, Hayes-compatible modern.
In Short: Among the best of the
newest generation of sophisticated

newest generation of sophisticated communications programs. Not copy professional CIRCLE 884 ON FEADER SERVICE CARD ASCOM IV

ASCOM IV pc ANYWHERE Dynamic Microprocessor Assocs. 545 Fitth Ave., #1103 New York, NY 10017 (212) 687-7115 (212) 986-5872 List Price: ASCOM IV, \$195; pc ANYWHERE, 595

Requires: Both programs: 128K

RAM, one disk drive, Hayes-com

patible modern, DOS 2.0 or later

In Short: ASCOM IV features Xmodem, Xon/Xoff, CRLF, proprietary, and Block V protocols. pc ANY-WHERE permits remote control of a PC and supports transfer rates of 10 2000 hore in hunt wined applica-

PC and supports transfer rates of 19,200 bps in hard-wired applications.

CPCLE 640 ON PEACER SERVICE CAVE

Omniterm 2

Lindbergh Systems

Lindicgs of systems
41 Fairhill Rd.
Holden, MA 01520
(6177 263-5049
List Price: \$175
Requires: 128K RAM, one disk
drive, autoanswer modem, DOS 2.0
or later.
In Short A modem support with
Xmodem protocol and unattended
inswer.

CRICLE 637 ON PEACER SERVICE CARD

PC-Talk III

Headlands Press Inc.

P.O. Box 862

Tiburon, CA 94920

(415) 435-0770

(1164cn, CA 59920)
(415) 435-0770)
List Price: Suggested contribution, 335 to program's creator
Requires: 64K RAM, one disk drive, Hayes-computible modern, DOS 1.1 or later.

In Short: A shareware program offering basic communications functions and the Xmodem protocol.

tions and the Xmodern protocol.

CRICLE ON PEACH SERVICE CARD

Carbon Copy, Version 2.14

Meridian Technology

LID Page 10, 1120

1101 Dove St., #120 Newport Beach, CA 92660 (714) 476-2224 List Price: \$195 Requires: 20K RAM, Hayes-compatible modem, DOS 2.0 or later. In Short: A sophisticated memoryresident program allowing remote F

In Short: A sophisticated memoryresident program allowing remote PC operation and occomputing. Not copy protected. ORGUE 838 ON READER SERVICE CARD

Microsoft Access Microsoft Corp. 10700 Northup Way Bellevue, WA 98009 (206) 828-880 List Price: \$250 Requires: 256K RAN

Requires: 256K RAM, two disk drives, autoanswer modern, DOS 2.0 or later. In Short: A communications program offering the X.PC link-level

In Short: A communications program offering the X. PC link-level protocol and multiple windows. CRCLE 636 ON READER SERVICE CARD

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mands. It makes

wonderful, Peter!"

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acclaimed industry standard for data recovery.

powerful utility that lets you systematically search for lost data and retrieve it with a few simple com-The Norton Utilities the highly

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so they cannot be altered or erased. Wipe File deletes data by file. Wipe Disk clears your entire disk. ther utilities measure avail-

able file space, test your disk for damage, and measure your computer's performance. PC Magazine calls The Utilities "Indispensable." The New York Times says Don't compute without it." Peter McWilliams (The Personal Computer Book) says "You'll bless this disk." Dozens of features keep your data in line. Every day.

The Norton Utilities. Designed for the IBM\*PC, PC-AT, and DOS compatibles. Available at Computerland and most soft-ware dealers. Order direct for \$99.95 from Peter Norton. 2210 Wilshire Boulevard, Santa Monica, CA 90403.

DATA RECOVERY

DISK MANAGEMENT A life saver for your data. ■ PC LAB NOTES

runs whenever you boot your system. This will save time when you use AT.BAT. since you won't have to run MODE.COM each time you want to use your modern. If you do this, however, watch out for pro-

 Don't order call waiting on any line with a modem. The call waiting signal sounds to the modern like a lost carrier signal, so the modem hangs up the phone.

grams that might reset your COM port in a way that would keep AT.BAT from working. Most communications programs initialize the COM port on their own without a line in AUTOEXEC.BAT, and most leave the COM port set appropriately for

CALL WAITING: A NO-NO Finally here are some practical hints

Don't order call waiting on any line with a modern. The call waiting signal sounds to the modern like a lost carrier signal, so the modern hangs up the phone and the carrier really is lost.

If you see bursts of random characters-called garbage-caused by noise on the phone line, you may have a bad phone connection. Hang up and place the call

Also be aware that one of the surest ways to generate garbage is for someone to pick up a phone while the computer is online. This is always annoying and can be a serious problem if you're in the middle of transferring a file. If you have several extensions in your office, or if your home is infested with typical teenagers, you should consider getting a dedicated line for the modem.

M. David Stone is a frequent contributor to PC Magazine.

# DISKSCAN FINDS BAD SECTORS



Bad sectors are bad news, but heeding the warnings of this messenger can keep your FAT from going into the fire.

very time you power up your PC, the ROM BIOS performs a thorough check of the memory installed in your system. Whether you like it or not, this check provides a measure of protection against a parity error that could otherwise sabotage your subsequent work.

Unfortunately, the BIOS does not perform a similar check on the hard disks in your system. This means that your hard disk may start developing bad sectors that you would know nothing about until you got the infamous "Abort, Retry, Ignore" message signaling that DOS can no longer

The DISKSCAN program presented there fills this gap by giving you a way to routinely monitor the health of your hand disk. Very simply, it reads every sector of the disk and reports all the errors it finds. Initially, DISKSCAN reads these sectors in big 64K chunks. (On most disks, this is cough for 128 512-94ye sectors.) If the program encounters an error while reading reads through the same sectors one at a time, reporting which sectors are bad and what types of defects characterized was

DIŚKSCAN will work on any disk or other block device that works with CHKDSK. That covers any disk that DOS installs automatically or any disk installed as a device driver in a CONFIG SYS file. This includes floppy diskettes, hard disks, Bernoulli Boxes, some tape drives, and even RAMdisks.

If it doesn't encounter any bad sectors, DISKSCAN takes about 2½ minutes to check a standard IBM 10-megabyte PC- XT hard disk, and about a minute for a 10-megabyte Bernoulli Box cartridge attached to a PC. Larger disks take longer, of course—not only because of their greater number of sectors, but also because the number of error reports increases. While you might not want to put DISKSCAN in your AUTOEXEC.BAT file, its regular use will alert you to disk problems that may be developing (and the need for backup) before your data disappears.

1'll be discussing how DISKSCAN works and, as usual, we'll explore a few related things together—in this case the organization of a disk and how programs can find out this information from DOS.

DISKSCANNING YOUR HARD DISK To run DISKSCAN you just enter DISKSCAN [drive:]

The program will use the default drive if you don't supply the optional parameter.

 DISKSCAN will work on any disk or other block device that works with CHKDSK, including any disk installed as a device driver. As it mus. DISKSCAN continuently displays the range of section it is reading. Since most disks use sectors that are 512 bytes long. DISKSCAN normally reset in 128 sectors at a time. If it encounters andror, it displays "Ernet" for that sector group, skips down a line, and starts reading these sectors one at a time. For each error encountered during this single-sector and, DISKSCAN displays both the number of the ball sector and the error yps. If It

DISKSCAN is on PC Magazine's Interactive Reader Service (IRS), so you can download it after dialing (212) 696-0360 with your modem. If your modem supports the Xmodem protocol, download the executable program DISKSCAN.COM. If you want a copy of the assembly language listing, download DISKSCAN .ASM. (Assemble it with MASM, link it with LINK, ignore the "no stack segment" message, and convert it to the .COM format with EXE2BIN.) If your communications software does not support Xmodem and/or if you don't have the IBM or Microsoft Macro Assembler, you can download DISKSCAN. ASC, rename it to DISKSCAN.BAS, load it into BASICA. and run it. Following this procedure will automatically create the DISKS-CAN.COM executable file.

If you don't have a modem, you can create the DISKSCAN.ASM file with any ASCII text editor by typing in the listing shown in Figure 1. Assemble, link, and convert it to .COM format as described above. Or, you can type in DISKSCAN

### PROGRAMMING/UTILITIES

```
DISESCAN, ASM -- Checke out dick by reeding ecctore
cere
                                          CS:CSEG, DS:CSEG, ES:CSEG, SS:CSEG
Entry
                            JEG
                                          Begin
              All Date
                                          'Copyright 1986 Eiff-Devic Publiching Co.'
'Programmed by Cherlee Petzold '
'Inveild Drives'
'Neede DOE 2.9-5'
'Neede DOE 2.9-5'
DriveError
MemoryError
ReedSegment
DriveMun
                           4444
DiekBlock
Totel Sectors
                                           18 dup (?)
SectoreIn64E
StartSector
                           99999999
                                          9, Sector $'
SectorLebel
                                          13, Sectore S'
DachLebel
ErrorLebel
CRLF
                                          ': Ecrori'
13,18,'8'
Erre, Erri, Erri, Erri, Erre, Erre, Erre, Erre
Erre, Erri, Erre, Erre, Erre, Erre, Erre
ErrorAddr
Kerd
                                           'Write Protects'
                                           'Unknown Dnits'
                                           'Drive Not ReedyS'
Ecc3
                                           'CRC Error$
                                           'Request Lengths'
                                                 k Errors
                                           Unknown Medies'
Err
Erre
                                          'Sector Mot Found$'
'Mo Peper$'
'Write Feult$'
'Reed Feult$'
'Generel Feilure$'
Erri
Erri
                            dt
                                           'Undocumented Error$'
Boot SectMag
Root DirMeg
                                          moot Sectors'
'Root Directorys'
'File Alloc. Tebles'
'Used by files'
'Unelloceteds'
'Flegged se bads'
'Can't Reed FATS'
laggs. Jane
                                           Boot Sector$
                            dt
BedFetMeg
InDeeMeg
                           db
Hot InDeeMeg
                                          10000, 1000, 100, 10, 1 ; For decimel conversion
              Check Drive Peremeter, DOS Vereign, end Enough Memory
Error Exit:
                                          AH,9
                                                                      ; Write error meecege
; through DDS
                            Int
                                                                      And terminete
                            Int
                                          20 h
Begins
                           Mov
                                          DX. Offeet DriveError
                                                                    eError ; Poeeible meeeege
; Check Drive Velidity Eyte
; If not zero, invelid drive
ereErr ; Poeeible meeeege
                           Dr
                                          AL, AL
                                          ErrorExit ; If n
DX, Offeet DosVersErr
                           AH, 3
21h
AL, 2
                                                38h
                                                                      g Get DOS Vereion Number
Check for 2.0 or leter
                                          ErrorZxit f If not, terminate with meceege
DX. Offeet HemorgError ; Foeeible error meeege
AX. 234-Offeet EndProg ; Set beyond program
SP, EX ; Hove stock closer to code
BX, 15 ; Mdd 15 to round up
                                                                      ; Add 15 to round
; Divide BX by 16
                                                4Ab
                                                                        Free allocated memory
by calling DDS Set Block
                                          ErrorExit
                                                                        Terminate on error
Aek for 64E bytee
by using DDS
                                          BX, 1000h
AH, 48h
                            Int
                                                                        Allocete Memory celi
Terminate on error
; Seve eegment of memory block
                                          ErrorExit
                                          [ReadSegment]. Ax
             Get Dick Information From DDS
                                         DL, DS: (005Ch) ; Get Drive Perameter
                                                                      ; Seve DS
; Cell DDS to
```

.BAS shown in Figure 2 and run it from BASICA to create DISKSCAN.COM.

WARNING If you decide to type in the assembly language listing, be very careful that you do not accidentally change the line that reads

Int 25h

in the ReadSectors routine to

Int 26h

It's very rare that a single wrong digit will cause a program to function disastrously, but this is one time that it will. Interrupt 26h is a disk write, and if you inadvertently use that instead of the (correct) Interrupt 25h, your mistake will result in DISK-SCAN's writing garbage to your entire disk. You won't even know it until it's too late. I'm not kidding. Please double-check that line of code before you try out the program. Better yet, try it out first on a junk diskette to make sure that the program is working OK before you run it on your hard disk.

And because I've just revealed the secret of booby-trapping DISKSCAN, be very wary of any illicit copies you may find floating around on bulletin boards other than PC Magazine's Interactive Reader Service.

READING THE DISK When you program in a high-level language or in assembler, you usually work with files and you really don't care how DOS stores those files on the disk. In fact, the major job of DOS is to organize your files on the disk by manipulating the directory, file allocation table (FAT), and data area so that you don't have to. (It isn't called a Disk Operating System for nothing.)

DISKSCAN is one of those rare programs that doesn't work with files-DISKSCAN needs to access the disk sectors directly.

If you've explored the BIOS interrupts in the DOS Technical Reference manuals, you may be familiar with the uses of Interrupt 13h, which the BIOS provides for directly reading and writing disk sectors. You should stay away from Interrupt 13h. however. Instead, you should take advantage of two other interrupts that DOS provides (25h for reading and 26h for writing)

Figure 1: The assembly language program for DISKSCAN.COM.

(Figure I continues)



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### ■ PROGRAMMING/UTILITIES

	Nov	D) 044 D(	mini pointe to biek block
	Hoy	CY 16 . 18 by	/ D1 points to destination /tes to copy'
	Cld		
		Movah / Move	'em in
	Pop		
	Hov	BX, Offset DiskBlock	; BX to address Disk Block
	Mov	DX, 1 , Set I	X:AX to 65,536
	Sub	AX, AX	
	Div	Word Ptr [SX + 2]	; Divids by Dytes Per Sector
	Hov	[Sectorsinesk], AL	1 Save Check values
	Dec	Word Ptr [SX + 2] [SectorsIn64X], AX AX, [BX + 13] AX	AX - Number of Clusters
	Boy	CL, [BX + 5]	Cluster to Sector Shift
	Sh1		
	Add	AX, CL AX, [BX + 11]	Add First Data Sector
	Mov	(Total Sectors), AX	; Add First Data Sector ; AX = Number Total Sectors Number (#=daf, l=A) it #=A, l=B
	Mov	AL, DS:[D#5Ch] ; Drive	Number (#=dsf, l=A)
	Dec	AL ; Make	it 8=A, 1=B b eign, not default drivs current diek calling DOS
	Jne	GotDrivaNumber ; It no	eign, not ostsuit drivs
	Int	70, 17n ) GBC C	calling DOS
GotDriveNumber	Hov	[DriveNuml. M.   Seve	Drive Number (S-A, 1-B)
		(	
; Stert	Resding		
MainLoops	Hov	DX, Offset SactorLabel	; String to display on screa
	Csll	StringWrite	. Display it
	Nov	AX, [StartSector]	Starting sactor number Display number on screan
	Call	MordWrits	: Display number on screen
	Hov	DX, Offset DashLabel	string containing a dach
	Call Ecv	StringWrite CX, [Sectors In64K] AX, CX	Display it on the screen Number of sectors to read
	Add	AX. CX	Add it to starting sactor
	Je	NumRecelc	, was it to starting sactor
	Cmp	AX, [Tots1Sectors]	; See it higger than total
	Jbs	NumSectorsOK	; If so, proceed
NumRecalc:	May	AX, [TotslSectors] CX, AX	; Otherwise get total sector ; Movs it to CX slso
	Suh	CX, [StartSector]	Now CX = sectors to read
NumSectoreOK:	Dec	AX	; AX - last sector to reed
	Csll	MordWrite	; Display it on screen
	Call	ReadSectors	I Read the sectors
	Jnc Csll	WaxtSectors RandSactors	; If no srror, skip dateil
	Jnc	Next Sectors	; Repest resd ; If still no error, skip
DiskStrot	Hov Call	DX, Offset SrrorLabel StringWrite	; String saying "Error!" ; Display it on ecreen
ErrorLoop:	Posh	cx	; Now save previous number
	Nov	Cx, 1	I So we can read one at a tim
	Call	ReadSectors	Read one sector
	Jac	HoError BL, AL	; If no arror, proceed ; Sava arror cods
	Mov	DI. Offset SectorLebel	; String with "Sactor "
	Call		
	Mov	AX. [StartSector]	
	Call	WordWrite	
		DX, Offsat DashLabel	
	Mov		
	Call		
	Call And	StringWrite BL, #Ph	; Display it on screen ; Blank out srror top bits
	Call And Sub	StringWrite BL, #Ph BB, BB	; Display it on screen ; Blank out srror top bits
	Call And Sub Add	Stringwrite BL, Sfh BB, BB BX. SX	, Display it on screen , Blank out error top bits , Now EX is error code , Double it for word screen
	Call And Sub Add Hov	Stringwrite BL, SPh BB, BB BX, EX DX, [ErrorAddr + BX]	p Display it on screan p Blank out arror top bits p Now EX is arror cods p Double it for word sccess g Gat address of message
	Call And Sub Add Hov Cell Call	Stringwrite BL, SPh BB, BB BX, EX DX, [ErrorAddr + BX] Stringwrite FindSector	; Display it on scream ; Blank out stror top bits ; Bow EX is stror cods ; Doubls it for word sccss ; Gat address of message ; Display message on scream ; See where sector is
	Call And Sub Add Hov Cell Call	StringWrits BL, SFh BB, BB BX, EX DX, [ErrorAddr + BX] StringWrits FindSactor DX. Offert CM.F	; Display it on scream ; Blank out stror top bits ; Bow EX is stror cods ; Doubls it for word sccss ; Gat address of message ; Display message on scream ; See where sector is
Noërror:	Call And Sub Add Hov Cell Call	Stringwrits BL, SFh BB, BE BX, BX DX,   ErrorAddr + BX  Stringwrits FindSector DX, Offset CRLF Stringwrits	, Display it on scream Blank out arror top bits Bow EX is arror cods Double it for word scens Cat address of message Display message on scream See where sector is String for new line Do cerriege rat a line fee
NoError:	Call And Sub Add Hov Cell Call Hov Call	Stringwrits BL, SFh BB, BE BX, BX DX,   ErrorAddr + BX  Stringwrits FindSector DX, Offset CRLF Stringwrits	, bisplay it on scream , biank out arror top bits , how EX is arror code , lost address of message , Display message on acream , fee where sector is , btring for new lime , bo cerriege rat & line fee , bick up the start sector , Gat back counter
NoError:	Call And Sub Add Hov Call Hov Call Inc Pop Loop	Stringwrite BL, SFh BB, BE BX, EX DX, [EtrorAddr + BX] Stringwrite FindSector Coffeet CdLP Stringwrite [StartSector] CX EtrorLoop	, Display it on scream , Blank out arror top bits , now EX is arror cods , Doubla it for word scens ; Gat address of message , Display message on scream ; See whets sector is , bting for new lime , Do Certiege rat a line feet , Bick up the start sector ; Gat back counter ; And read maxt sector ; And read maxt sector
NoError:	Call And Sub Add How Cell Call How Call Inc Pop Loop Moy	Stringwrite BL, SFh BB, BE BB, BE BC, BT, BrrorAddr + BX] Stringwrite FindSactor DX, Offset CMLP Stringwrite [StartSector] CX ErrorLoop AX, [Distrinctor]	, Display it on scream, plank out strot top bits , man but strot top bits , move BX is strot rods cass constant strot top the strot rods cass constant strot of recessor . Display measures on scream ; see where sector is , string for new line , so certainey ex at a line feet plot occurrence rat a line feet plot occurrence rat a line feet . Sich up the start sector ; and read mast sector ; and read mast sector ; Sector of next group
	Call And Sub Add Hov Call Hov Call Inc Pop Loop Hov Jmp	StringWrits BL, SPh BB, BE BJ, SR BJ, SX DX, ISCORMOR + BX EXINGWRITS  [StartSector] CX RrowLoop AX, UntartSector] Short ChackFinish	, Display it on scream; blank out strock cop Dita Blank out strock cop Dita Blank out strock cop Dita Deubla it for word scenes Cet address of message; Display message on scream; fee whets sector is provided by the section of the best counter. I make the sector of the best counter and trade best counter. I make the sector of the best counter. I make the sector of
	Call And Sub Add How Call How Call Inc Pop Loop How Jmp	StringWrits BL, SPh BB, BE BJ, SR BJ, SX DX, ISCORMOR + BX EXINGWRITS  [StartSector] CX RrowLoop AX, UntartSector] Short ChackFinish	, Display it on scream; blank out strock cop Dita Blank out strock cop Dita Blank out strock cop Dita Deubla it for word scenes Cet address of message; Display message on scream; fee whets sector is provided by the section of the best counter. I make the sector of the best counter and trade best counter. I make the sector of the best counter. I make the sector of
	Call And Sub Add How Call Call How Call Inc Pop Loop How Jmp How Add	StringWrits BL, SPh BB, BE BJ, SR BJ, SX DX, ISCORMOR + BX EXINGWRITS  [StartSector] CX RrowLoop AX, UntartSector] Short ChackFinish	, Display it on scream; blank out strock cop Dita Blank out strock cop Dita Blank out strock cop Dita Deubla it for word scenes Cet address of message; Display message on scream; fee whets sector is provided by the section of the best counter. I make the sector of the best counter and trade best counter. I make the sector of the best counter. I make the sector of
NoError: NextSectors:	Call And Sub Add How Call How Call Inc Pop Loop How Jmp	Stringfile BL, 97h BL, 97h BL, 97h BX, EX BX	, Display it on scream, plank out strot top bits , man but strot top bits , move BX is strot rods cass constant strot top the strot rods cass constant strot of recessor . Display measures on scream ; see where sector is , string for new line , so certainey ex at a line feet plot occurrence rat a line feet plot occurrence rat a line feet . Sich up the start sector ; and read mast sector ; and read mast sector ; Sector of next group

(Figure I continues)

for accessing disk sectors directly.

The PC-DOS programs CHKDSK, RECOVER, and DEBUG all dueetly ascess disk sectors, and all off them use Interrupts 25h and 26h, not Interrupt 13b, but (FDISK, FORMAT, SYS, DISKCOPY, and DISKCOMP use Interrupt 13b, but PDISK has to because you use it before DOS even recognizes the disk. FORMAT and DISKCOPY must format a disk, which can only be done through Interrupt 3h, but

The first reason for avoiding Interrupt 13 is that not all disks support it. For instance, many block devices installed in a CONFIG.SYS file (the Bernoulli Box, a RAMdisk, and some tape backup systems are examples) do not use Interrupt 13h at all. Interrupt 13h is really just for IBM disks or imitations of IBM disks.

Interrupts 25h and 26h are also easier to use than Interrupt 13h. To use them you don't need to know the specific construction of the disk (tracks, sectors, cylinders, sides), and you can simply treat the disk as a string of consecutive sectors, starting at sector 0.

A FEW LIMITATIONS The only real disadvantage of using Interrupts 25h and 26h is that they can access only the DOS partition of a land disk, not the entire disk. Even if your hard disk is partitioned entire. by for DOS (as most are), Interrupts 25h and 26h cannot get at the partition table, which is stored on the first sected had 26h cannot get at the partition table, the control of the three disk. To Interrupts 25h and 26h, sector 6 is a disk. To Interrupts 25h and 26h, sector 6 is namely, the sector that contains the boot record of the DOS partition.

When using Interrupts 25h and 26h in a roopam, you mant also he aware that the years up the stack somewhat. When DOS enturns from these interrupts, it uses the carry flag to signal an error, but your original flags are still on the stack. Thus, your program should pop the flags off the stack or you'll run into problems. While shot a big deal in assembly language, this little quite, will prevent you from using any balle in interrupt functions in a compiled quite, will prevent you from using any balle in interrupt functions in a compiled Microsoft C5. In 1869 for Interrupts 25h and 26h. Write an assembly language subroutine instead;



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  - panallel port
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N READER SERVICE CARD

### ■ PROGRAMMING/UTILITIES

Tendinate 1 28h	CheckFinish:	Cmp	AX, [TotslSectors] Terminate	; See if at then and : If so, just terminate
FindSector:   No.   Dec   Offeet Dankhaled		Jmp	MainLoop	
FindSector:	Terminate:	Int	20h	; Terminats
Call Satisfaction of the company of	; Find !	Sector in	FAT to see if used by fi	le, etc.
April	FindSector:	Nov	DX, Offset DashLabel	; Print dash
No.   Colored boundedcapes   colored bounde		Cell	StringWrite	
Cap Art Need Tir (Dishblock + 6)   the in sector how he was a sect		Nov	AX, [StartSector]	; Sector with error
Temperature		Nov	DX, Offset BootSectRag	) Set up meseage
No.		1h	Print Hos	If so print se s
Continued to the continued of the contin		How		; Set up message
Continued to the continued of the contin		Cmp	AX, Word Ftr [DiskBlock	+ 16] ; See if sector in
No. 1   Section   Section				; If so, print as a
No. 1   Section   Section		Nov	DX, Offset MootDirMsg	) SEC UP Bessage
No. 1   Section   Section		Jb.	Print Man	If so, print as s
No. 1   Section   Section		bush	[StartSector]	; Save the sector
No. 1   Section   Section		Nov	AX, Word Ftr [Disk8lock	+ 6] ; Reserved sectors
No. 1   Section   Section		Nov	[StartSactor], AX	; Start of first PA
Call		Sub	CE, [DiskBlock + 15]	; Sectors for FAT ; Kero out top byte
The content of the		Call	ReadSectors	. Read in PAT
Some Det Coffeet Fathworking   1st on proteint   1st on the community   1st on proteint   1st on the community   1		Pop	[StartSector]	
A Proper Note of the Control of the		Mov	DX, Offset PatReedHag	; Set up possible =
A Proper Note of the Control of the		Je	AV ISBART Sector 1	; it read error, pr
More C. [Distance - 5]   Secret Date Second Add Add 2   Second Date			AY, Word Ptr [DickBlock	
AL C		Mov	CL. [DiskBlock + 5]	
		Shr	AX, CL	
No.   St.   Leaddingsment   M.   M.   Assemble of For   Color   Color		Add Donb	AX, 2 ES	; AX ie now cluster ; Save ES for awhile
Telegraph   Tele		How	EC. [ReadSement]	
And the Ad A The Court of the C		Cmp	Word Ftr [DiskBlock + 1	3), SFFSh; 12 or 16-bit FAT?
Month of the control		Jge	Fat16Bit	, And jump accordingly
The first content of the content o		Mov	BX, AX	; This is cluster number
And Market   1 for or former with the set    And C. A.		Nov	SI, AX	) So is this
And Market   1 for or former with the set    And C. A.			AV POLIDY A STI	, BY A ST m 1 5 CX
Mar.		Jnc	NoShift	I If no CY from shift, got
modaliti Co A. Freeh Park Control Cont			CL, 4	; If CY from shift must
Triblett: Boy Br. Ad   This is cluster mumber Br. Ad   This is a cluster mumber Br. Ad   This is a cluster Br. Ad				
Triblett: Boy Br. Ad   This is cluster mumber Br. Ad   This is a cluster mumber Br. Ad   This is a cluster Br. Ad	MOSBITCI	Own	AX. SPESSE	: See if zero otherwise
Date No. 2 (12)   Polyheat word from sector A. A. A. (12)   Polyheat word from sector A. A. A. (12)   Polyheat word from sector A. A. A. (12)   Polyheat word from sector A. (12)   Polyheat word for the sector A. (12)   Polyheat word for for the sector A. (12)   Polyheat word for		Jap	Short Chuckword	
No. As Selical publications of the selection of the selec	Fatl6Sit:	Nov	BX, AX	; Thie is cluster number
Chackword: To A. D. Control Nationales, and the print chackword: The control of t		Shl	BX, 1	, Dull out word from sector
Trinkeys Call District No. 10 to 10 possible message to 10 possible		Or	AX, AX	; See if zero [unsllocated)
Teinheam haftsphan   ff me prantmeament   Que   Que   Que   ff me prantmeament   Que   Que   Que   ff me   Que   Q	CheckWords	Fop		; Get back ES
Dog Co. Corpers, healt-spine; j. the of Petallic Processing.  Frinkeg:  Frinkeg:  Read Sector (CK = Number of Sectors, Neturn CT and AL for arror)  ReadSector (CK = Number of Sectors, Neturn CT and AL for arror)  ReadSector (CK = Number of Sectors, Neturn CT and AL for arror)  ReadSector (CK = Number of Sectors, Neturn CT and AL for arror)  ReadSector (CK = Number of Sectors, Neturn CT and AL for arror)  ReadSector (CK = Number of Sectors, Neturn CT and AL for arror)  ReadSector (CK = Number of Sectors, Neturn CT and AL for arror)  ReadSector (CK = Number of Sectors, Neturn CT and AL for arror)  ReadSector (CK = Number of Sectors, Neturn CT and AL for arror)  ReadSector (CK = Number of Sectors, Neturn CT and AL for arror)  ReadSector (CK = Number of Sectors, Neturn CT and AL for arror)  ReadSector (CK = Number of Sectors, Neturn CT and AL for arror)  ReadSector (CK = Number of Sectors, Neturn CT and AL for arror)  ReadSector (CK = Number of Sectors, Neturn CT and AL for arror)  ReadSector (CK = Number of Sectors, Neturn CT and AL for arror)  ReadSector (CK = Number of Sectors, Neturn CT and AL for arror)  ReadSector (CK = Number of Sectors, Neturn CT and AL for arror)  ReadSector (CK = Number of Sectors, Neturn CT and AL for arror)  ReadSector (CK = Number of Sectors, Neturn CT and AL for arror)  ReadSector (CK = Number of Sectors, Neturn CT and AL for arror)  ReadSector (CK = Number of Sectors, Neturn CT and AL for arror)  ReadSector (CK = Number of Sectors, Neturn CT and AL for arror)  ReadSector (CK = Number of Sectors, Neturn CT and AL for arror)  ReadSector (CK = Number of Sectors, Neturn CT and AL for arror)  ReadSector (CK = Number of Sectors, Neturn CT and AL for arror)  ReadSector (CK = Number of Sectors, Neturn CT and AL for arror)  ReadSector (CK = Number of Sectors, Neturn CT and AL for arror)  ReadSector (CK = Number of Sectors, Neturn CT and AL for arror)  ReadSector (CK = Number of Sectors, Neturn CT and AL for arror)  ReadSector (CK = Number of Sectors, Neturn CT and AL for arror)  ReadSector (C			DX, Offset NotInUseMsg	) Set up possible message
Cap Al, PSTPD, p. See If closter flagged by Cap		31	DY Office hadring	, fut up possible message
Transmission   Tran		Cnp	AX. GPPP7h	; See if cluster flagged ba
Frinkeys Call Resimpletis , Frink Claster Guren ; Reed Sectors (CK. * Mumber of Sectors, Petern CF and AL for arror) } ReedSectors (CK. * Mumber of Sectors, Petern CF and AL for arror) } ReedSectors (CK. * Mumber of Sectors, Petern CF and AL for arror) } ReedSectors (CK. * Mumber of Sectors, Petern CF and AL for arror) } ReedSectors (CK. * Mumber of Sectors (CK. * Mumber of Sectors) } Reed Sectors (CK.		Jz	Frint Hea	; If so, print message
hed entering and he desired for the desired fo		Nov		
Residentical Pubb SI	PrintReg:		StringWrite	; Frint cluster disposition ; And return
Public Control of the		Sectors (	CX = Number of Sectors, R	teturn CY end AL for error)
Public Control of the	RendSectors:			; Fusb all needed registers
Publish DE (Deltumba) - Oct bas delte mache code midde de la SE - Deltumbe code del se delte mache code midde del se delte mache code more del se delte mache code del se delte mache code del se delte mache code del se delle se d		Push	CX	
Nov AL, [CiveMan] jet the dire member code Nov II, [Interfacetor]   Nov III, [Interfacetor]   No		Push	DX	
now to the state of the state o				. Get the drive number onde
New Do.   Undertweeter     1 addition of the company     1 addition of the company		Sub		
Int 25h , Abnolute Disk Reed Pop BX , Flau picker Pop BX , Flau picker Pop DX Pop DX Pop DX Pop BX Ret , Return to program		Nov		
Pop BX ; Fis up ctack Pop BS ; Get back registers Pop BX Pop CX Pop BX Ret ; Raturn to program		Nov	DS, [ResdSugment]	
Pop DS ; Get Dack registers Pop DX Pop CX Pop BX Ret ; Raturn to program			20B	1 wosolnce ning Kend
Fop DX Pop CX Pop BX Ret ; Raturn to program		rop		, Cat back registers
Pop CX Pop BX Ret , Raturn to program			DX	, our outs registers
Pop BX , Return to program		Pop	cx	
		Pop	BX	Raturn to program

DISK ORGANIZATION As you may know from the DOS Technical Reference manuals or from reading Peter Norton's books and columns, a disk is divided into four separate areas; the boot sector (usually just the first sector), the file allocation tables (generally a disk maintains two identical copies), the directory, and the data.

Under DOS 1.1, it was pretty easy to determine the number of sectors used for each of these areas of the disk. The layout of the two supported disk formats (double-sided and single-sided) was fixed. But if you've ever fooled around with PDISKing a hard disk into several partitions or used DVIDIS 3.x, you'll see that DOS 2.0 and above can support an almost infinite variety of disk formats.

For DISKSCAN to scan through all the sectors of a hard disk, it must know the total number of sectors on the disk or (in the case of hard disks) in the DOS partition. This is not a trivial problem, for the information is simply not readily available from the documented DOS function calls. The closest you can come is with DOS Interrupt 21h Function Calls 1Bh, 1Ch, and 36h. These return CX equal to the number of bytes per sector, DX equal to the number of clusters, and (for 36h only) BX equal to the number of free clusters. But the clusters (which comprise one or more sectors) only pertain to data. These function calls do not tell you the number of sectors used by the FAT or the directory.

Instead, you have to use DOS Interrupt 21F Fuerion Call 23th to calculate that number of sectors on the disk. DOS maintains a "DOS Disk Block" the termina opy is mine) for every disk on your system. This DOS Disk Block devention of 23th atlayout of the disk. Function Call 32th atlows you to look at it. Since IBM evention Call 32th atlows you to look at it. Since IBM evention Call 32th atlows you to look all 32th in its DOS Tosk Block can all Function Call 32th in its DOS Tosk Block or all Reference manuals. Two presented a description of them in Figure 3.

To complete the picture drawn in Figure 3, he related Function Call I Fhreturns the same information as 23h, but for the default drive. (This function call even works in DOS 1.1, although the information is slightly different.) As you'll notice from Figure 3, each DOS Disk Block contains a doubtle-word address that points to the next one. The DOS Disk Blocks are





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data saver, and high speed switching at an incredibly low K, and it worked like Then one day a

> software company and a company discovered the and issued

an edict for a EMS. In no time at all

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which used the EMS. It still

has the the warm rethe switching and the low

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### ■ PROGRAMMING/UTILITIES



```
BASIC PROGRAM TO CREATE diekscen.COM
128
138
     FIELD #1,1 AS AS
CHECKSUN = 8
          LINESURE = 8
FOR JE = 1 TO 8
178
188
198
               READ BYTES
CHECKSUN - CHRCKSUN + BYTES
LINESUMS - LINESUMS + EYTES
          IF (BITES
FOT $1
NEXT JS
                                                           AS - CHRS(BYTER)
               LINECKECK O LINESUNG THEN PRINT "Error in Line"; 288 + 18 * IN
268
     CLOSE
     IF CHI
                   SUM - 931E3 THEN PRINT
                                                             ccessful Completion!*
                 COM file is not valid!"
                                                          END
                                                                 67
300
                                                                116
                                                                          32,
                                                                                     182
328
338
                                          118,
                                                                           32,
185,
                                                                                     110,
                                          11,
97,
32,
32,
32,
32,
                                                                                                 32
186
111
                                                                189
                                                                           97,
116,
118,
185,
115,
48,
32,
378
388
                                                                                                            746
743
631
398
488
418
428
438
                                                                114,
198,
46,
115,
0,
                                          32,
32,
101,
                                                     188
                                                                                                   36
                                                                             ***
                                                                                                 101
                                                                                                            193
                                                                                                 (Finer 2 cont
```

Figure 2: A BASIC program that will create DISKSCAN.COM.

thus organized in a chain within DOS. The chain begins with drive A: and continues adjushabetically for every disk (or other block device) in your system. Function the chain of the word that begins the chain; that is, the double word stored at ES-BX is the advents of the DOS Disk Block for drive A: You should know, too, that Function Calls if the modium has been changed. Function Call S-A abone does not cause a function call S-A abone does not call S-A abone does not call S-A abone does not cause a f

DOS calculates the information in the DOS Disk Block by first making a BIOS Parameter Block call to the device driver. (The BIOS Parameter Block is well documented in the DOS Technical Reference manuals, so I won't repeat the information here.) You'll notice that the DOS Disk Block contains the address of the device driver header. With this address, a program could even make calls directly to the device driver, including a BIOS Parameter Block call. You may also be interested in DOS Function Call 53h, which translates the information in the format of the BIOS Parameter Block table (pointed to by DS:SI) to the format of the DOS Disk Block table (pointed to by ES:BP)

DISKSCAN only needs a few pieces of information from the DOS Disk Block. Specifically, it needs the number of cluses seen used for data, the number of sectors per cluster, the sector number where data begins, and the number of bytes per sector. (Most often a disk will use 512 bytes per sector, but RAMidsts may use less per disks larger than 32 mags will see the control of the seen of the form of the control of the con-

Whenever you need to directly access disk sectors in the directory or FAT, don't make any assumptions about where these sectors are located. Use Function Call 32h to get the information. That's what it's there for.

TRY AND TRY AGAIN When a program makes DOS function calls for accessing files, DOS calls the device driver to read and write the appropriate sectors. The de-

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684 724 416 638 99, 114, 50, 13, 2, 2, 32, 34, 32, 185, 36, 111, 36, 33, 234, 35, 66, 125, 191, 116, 118, 32, 110, DATA DATA DATA DATA 111, 221, 28, 77, 125, 287, 18, 68, 189, 87, 111, 187, 719 169 376 478 114, 116, 116, 101, 97, 111, 773 105, 101, 111, 36, 111, 36, 32, 36, 111, 115, 99, 119, 68, 116, 105, 32, 100, 119, 690 717 82, 187, 189, 67, 67, 114, 116, 799 745 567 788 754 100, 82, 36, 32, 67, 82, 76, 658 DATA 658 DATA 658 DATA 678 DATA 688 DATA 698 DATA 788 DATA 718 DATA 116, 184, 36, 114, 111, 97, #3, 101, 181, 187, 32, 753 116, 69, 187, 188, 111, 111, 88, 185, 658 DATA 678 DATA 688 DATA 788 DATA 718 DATA 718 DATA 728 DATA 738 DATA 758 DATA 758 DATA 758 DATA 758 DATA 768 DATA 768 DATA 618 DATA 618 DATA 618 DATA 618 DATA 114; 110; 105; 111, 119, 36, 78, 180, 181, 32, 181, 116, 188, 181, 114, 110, 83, 101 767 32, 118, 112, 161, 111, 36, 114, 78, 32, 111, 87, 117, 32, 664 695 741 97, 116, 36, 117, 114, 114, 100, 70, 110, 746 634 756 724 116, 97, 181, 188, 111, 82, 188, 97, 97, 36, 32, 161, 185, 188, 181, 117, 99, 32, 111, 114, 36, 116, 771 864 698 719 797 DATA DATA DATA DATA DATA DATA DATA 100, 66, 116, 32, 114, 65, 97, 100, 69, 111, 114, 114, 114, 32, 82, 101, 36, 114, 70, 111, 101, 121, 110, 101, 101, 114, 185, 36, 188, 188, 98, 85, 116, 111, 116, 101, 32, 115, 105, 108, 70, 746 687 653 741 68, 121, 188, 98, 32, 36, 97, 103, 98, 116, 181, 185, 99, 36, 32, 97, 188, 181, 161, 99, 188, 46, 85, 182, 188, 36, 32, 67, 97, 39, 8, 111, 32, 84, 101, 100, 111, 100, 115, 110, 848 858 868 878 DATA DATA DATA 888 DATA DATA DATA DATA 97, 32, 39, 78, 188, 285, 192, 285, 183, 97, 32, 84, 18, 97, 748 599 545 388 747 1856 936 1122 900 910 920 930 940 232, 32, 3, 9, 18, DATA DATA DATA DATA DATA DATA DATA 8, 33, 117, 33, 187, 177, 114, 186 32, 186, 285, 186, 89, 114, 139, 235, 8, 163, 188, 948 DATA 958 DATA 958 DATA 978 DATA 978 DATA 1808 DATA 1818 DATA 1, 232, 227, 188, 16, 114, 50, 185, 117, 184, 184, 195, 285, 72, 68, 913 978 612 894 1181 767 658 72, 138, 33, 186, 163, 79, 285, 22, 139, 252, 33, 92, 243, 243, 202, 30, 117, 31, 192, 71, 3, 0, 33, 105, 186, 137, 135, 200, 285, 137 1 43, 247, 13, 71, 119. 1898 DATA
1878 DATA
1878 DATA
1878 DATA
1878 DATA
1878 DATA
1878 DATA
1898 DATA
1898 DATA
1198 DATA
1118 DATA
1128 DATA
1128 DATA
1228 DATA
1228 DATA
1248 DATA 1, 166, 158, 232, 224, 92, 285, 232, 11, 200, 116, 161, 823 832 988 798 956 682 495 211, 168, 25, 1, 51, 139, 59, 186, 186, 93, 114, 161, 162, 1, 168, 139 110 232, 14, 6, 139, 18, 241, 58, 232, 8, 227, 1, 1, 43, 232, 115, 81, 43, 135, 72, 75, 115, 164, 8, 188, 21, 219, 232, 8, 161, 916 232, 232, 232, 232, 228, 228, 1, 235, 128, 14, 246, 78, 185, 138, 161, 1, 255, 1 1883 551 1158 789 186, 218, 139, 232, 3, 1, 232, 141, 232, 115 33, 186, 1, 168, 42, 232, 1, 89, 161, 12, 115, 168, 124, 114, 1867 898 938 886 1874 151, 139, 41, 255, 139, 6, 59, 255, 8, 6, 59, 27, 54, 172, 175, 186, 139, 235, 1, 135, 32, 139, 232, 12, 114, 116, 226, 139, 163, 144, 114, 123, 6, 59, 139, 138, 133, 1/1, 186, 186, 163, 237, 156, 255, 139, 232, 128

vice driver then uses Interrupt 13h (in the case of an IBM or compatible hard disk or diskette), or goes directly to the I/O ports of the device (in the case of a Bermoulli Box), or just accesses memory (in the case of a RAM(disk)

If the device driver cannot carry out the request because of a problem with the disk, DOS tries calling the device driver again. This sometimes works and sometimes does not. If after three successive tries the device driver still returns an error, DOS displays its Critical Error "Abort, Retry, Ignore" message. Internities 25th and 26th, however, make

undergo as Access and Access and

Although Interrupts 25h and 26h go out to the device driver only once and do not retty, you may notice sometimes (particularly the control of the control of

TRACKING DOWN BAD SECTORS When you first formatted your hard disk, you may have noticed that the FORMAT command indicated that the disk had some bad sectors (most do). When you run CHKDSK, you may also see a line telling you that some bytes of the disk are in bad sectors. Moreover, while CHKDSK may indicate that your PC-XT hard disk has, for instance, 4096 bytes in bad sectors. DISKSCAN may ell you that only one 512-byte sector is dol. This is because the

(Figure 2 continues)

### ■ PROGRAMMING/UTILITIES

1338 1		91,		143,	6,	139,	1,	186,	229,	795
1348		2,	114,	78,	161,	139,	1.	43,	6,	544
1356		128,		130,	14,	122,	1.	211.	232,	847
1368 :		5,	2,		6.	142,	6.	114,	1,	276
1378 :	DATA	129,	62,	130,	i,	248,	15,	125,	23,	725
1360	DATA	139,	216,	139,	248,	209,	235,	30,	139,	1355
1390	DATA		115,	4,	177,	4,	211,	232,	13,	756
1400			248,	61.		248,	235.	9.	139.	924
1418		216,	289,	227,	38,	139,	7,	11,	192,	1039
1428 :	ATAC	7,	186,	282,	2,	116,	11,	186,	214,	924
1438 1			61,	247,	255,	116,	3,	186,	189,	1859
1448	DATA	2,	232,	74,	- 1,	195,	83,	81,	82,	749
1458 1	DATA	30,	168,	116,	1,	43,	219,	139,	22,	738
1468		139,	1.	142.	38,	114.	1.	205.	37.	649
1478 :	DATA	91.	31,	90.	89.	91.	195.		83,	758
1486	DATA	81.	82.	86,	198.	244.	2.	185.	4.	874
1496	DATA		139.	28.	131.	198.	2.	43.	210.	751
1500 1	DATA	247,	243.	\$2,	10,	232,	116.		4,	942
1518 1		40,	130,	200.	100.	2.	205.	33,		902
1528 1		254,	281,	127.	229.	161,	1.	116,	225,	1334
1538 1		94,	98,	89.	91,		195.	80,	100,	987
1548 1	DATA	9,	285,	33,	88,	195,				530

(Figure 2 ends)

file allocation table works with clusters. If any sector of a cluster is bad, the whole cluster must be marked.

Fortunately, when the FORMAT command encounters bad sectors, it places an indicator in the file allocation table so these. sectors cannot be used for data. DISK-SCAN cross-references the bad sectors it finds against the list DOS put into the file allocation table at format time and returns the reassuring report, "Flagged as bad," when appropriate. The best thing to do, then, is to run DISKSCAN soon after you format a hard

disk and print out the list of bad sectors it encounters. Then, when you later run DISKSCAN, check the new list against the old. (Since paper lists have a way of getting lost, it makes sense to use the DOS redirect facility to create a file of known bad sectors against which subsequent DISKSCAN outputs can be compared.)

COMMON ERROR MESSAGES AIthough DISKSCAN has error messages for the 13 different types of errors it can find, some of them (like "Write Protect" and "No Paper") are obviously inapplicable. The error types you'll most commonly see will be CRC Error: When information is

stored on a disk, a check-sum value (otherwise known as the Cyclic Redundancy Check) is also stored on the disk. If this value does not agree with a recalculated value when the data is read, then the assumption is made that the data is invalid. and you'll get this message. Sector Not Found: This indicates that

the boundaries that FORMAT created to mark the sectors have been destroyed and the sector being read is no longer clearly marked on the track. You may get several of these messages in a row.

Read Fault and General Failure: These are generalized errors that don't fall into the other categories. DISKSCAN's second set of messages

will probably be of greater belo to you in tracking down the trouble:

File Alloc, Table and Can't Read FAT: These point to a very serious situation. Stop whatever you're doing and back up everything you can, using the DOS COPY command, then reformat your hard disk before you restore your backed up files. Boot Sector: This is a little easier, since

you could always reboot your machine from the drive A: floppy. Put your DOS disk in A: and execute the command SYS C:, followed by COPY COMMAND.COM C: to replace the boot-up files on your hard disk with fresh copies, and see if this isn't enough.

Root Directory: Errors here could keep you from later being able to load a file or save updates to it. If you run CHKDSK, you will probably get messages referring to unallocated cluster chains or crosslinked files. You may have to run CHKDSK/F to fix these. [See also the PC Lab Notes column entitled "Eradicating Erasure Errors," in PC Magazine, Volume 5 Number 7-Ed.1

Unallocated: A disk error in an unallocated sector of the disk is not yet serious since that sector is not currently being used by any file. On the other hand, when a file eventually gets written to that area, you'll

DOS Int 21h Function Cell 32h -- Get "DOS Diek Block"

On Entry Register Contents

32h Number of Disk Drive (#-defsult, 1-A, etc.) On Returo Register Contents

AL - 88 if drive eeiete, PFh for invalid drive DS:81 Pointer to DOS Disk Block Description

The DOS Disk Block contains the following information at the indicated offsets of De:BX

81 82 84 85 86 88 88 Byte SD

Drive: 8-A, 1-B, stc. Unit withio driver (8, 1, 2, etc.) Unit within driver us, set of the sector bytes per sector bectors per cluster - 1 Clouter to sector shift Rumber of Tearred (boot) mectors Rumber of Tearred (boot) mectors Rumber of Tearred (bott) mectors Rumber of Tearred (bectory shift sector) cluster 2 te first data cluster) the sector of clusters + 1

ectors for PAT Sectors for PAT Sector number of directory Address of device headsr Hedis Descriptor Syts Sero if disk has been ecce

dress of next DOS Disk Flock (FFFF if last one in chain)

ure 3: The undocumented DOS Interrupt 21h Function Call 32h is useful for obtaining information about the structure of a disk.

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#### ■ PROGRAMMING/UTILITIES

get an "Abort, Retry, Ignore." When that happens, select "Ignore," rename the file just saved to something else, save your file again, then use RECOVER on the first file. This way DOS will flag the bad clusters and not try to use them later. Then delete the first file, keeping the second version you saved.

Used by file: Which files-and what can be saved from them-are the questions when you get this message.

Unfortunately, to expand the already long DISKSCAN code to pinpoint just which files contain these bad sectors is not feasible in this column. DISKSCAN would have to start accessing directory and subdirectory entries, find the cluster where each file began, and then look in the file allocation table for the chain of clusters until it happened upon the same one. Still, there

are things that can be done. One possible way to track down the files that contain bad sectors is to use my SWEEP program (PC Magazine, Volume 4 Number 23), which executes a command over all subdirectories on your hard disk. You would start at your root directory and enter the command

SWEEP COPY \*.\* NUL

Whenever COPY tries to read a file with a bad sector, you'll get an "Abort, Retry, Ignore" message. Write down the name of the file (the one that appears above the message), press "I", and continue.

USING RECOVER A file with a bad sector right in the middle of it can present problems to programs that use the file. The first thing you'll want to try to do is copy it to another file with a different name, using

"R" when DOS asks you to "Abort, Retry, Ignore." If that doesn't work, you have the opportunity of using one of the most neglected of all the PC-DOS commands. This command is called RECOV-ER. To use it enter

RECOVER filename

where "filename" is the name containing the bad sector. RECOVER will do two things: First, it will mark the bad sector or sectors (more precisely, it marks the clusters that contain these bad sectors) as bad in the file allocation table, so they cannot be used again. Second. RECOVER patch-

es the file together so that those bad sectors are skipped.

(Do not use RECOVER without the filename parameter, however: it performs quite differently and will not do what you

Will the RECOVERed file be usable? That depends. If it's a .COM or .EXE program, then it will probably crash if you try to run it because it's missing a piece. If it's a worksheet file or database file, your spreadsheet or database program will probably choke on it. If it's a word pro-

 If you regularly back up your hard disk and run DISKSCAN, you'll have some insurance against catastrophe and reassurance about the health of your data.

cessing file or a program source listing, however, you may be in luck. It will be missing something, but a good deal of it may still be there, and you may be able to reconstruct the rest.

THE EARLY WARNING Recovery of a disk or data that has developed bad sectors is an art in itself. If you can, you want to avoid the process entirely.

Thus DISKSCAN's most useful function is to give you an early warning that your hard disk is showing signs of decay. If you regularly back up your hard disk and run DISKSCAN, you'll at least have some insurance against catastrophe and reassurance about the health of your data. If DISKSCAN starts to show more and more bad sectors every time you run it, probably the best thing you can do is dig out your warranty and start reading it.

Charles Petzold is a contributing editor of PC Magazine and the editor of the PC Tutor column.



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That means you can selectivel

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# SPREADSHEET CLINIC



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#### COLOR ADJUSTMENTS IN SYMPHONY LIAND 1-2-3 2.0

Now that Lotus has released new versions of both Symphony and 1-2-3, it's time to adjust the colors to something more pleasing. The procedure, using DEBUG.COM. is very much like the one outlined in your column of July 9, 1985 (Volume 4 Num-

For both programs, the colors on the screen are controlled by the device drivers, which are in special files: LOTUS.SET for Symphony and 123.SET for 1-2-3. If you have alternative configurations stored in .SET files with different names, you can change the colors in them, too. Each color is a single hexadecimal digit, and two colors are stored at each program address. The following instructions are for modifying Symphony 1.1's colors, but the procedure for 1-2-3, Version 2.0, is exactly the same. Just substitute the name of the proper .SET file. Note that every occurrence of 0 is a zero, not a capital letter O.

First, make a backup copy of your current LOTUS. SET file in case you do something awful to it. Next, put the Symphony program disk in drive A: and a disk with DEBUG.COM on it in drive B:. At the A> prompt, type

b:DEBUG lotus.set<Enter> At DEBUG's - prompt, type

s 100 agas 07 30 0a 3f (enter)

This is a search operation to locate the address at which the default color values, 07 30 0a 3f, appear. DEBUG will now re-

spond with the address-something like 0AD6:19ED. (Different LOTUS.SET files will produce different addresses because they are configured for different systems.) To display the values at that address, type

d XXXX:XXXX<Enter>

using the address DEBUG gave you in place of the XXXX's. To change the values for the color settings, type

e YYYY:YYYY/Feter>

DEBUG will respond with 07, which is the first color value. Type two new digits and hit the space bar. DEBUG will then give you the second pair of numbers, 30, and you type two new digits. Hit the space bar and keep going until you have typed new numbers for all four pairs. Then hit Enter. When you get the - prompt again, type

w<Enter>

Now that Lotus has

released new versions of both Symphony and 1-2-3, it's time to adjust the colors to something

more pleasing.

DEBUG will tell you how many bytes it is writing. At the - prompt, type

4 red

5-purple

6-brown

7-white

This takes you out of DEBUG and back to the A> prompt.

I like to leave the first and third pairs of numbers as they are (just hit the space bar without typing new values) and change the second to 1B and the fourth to 20. This changes the background colors as well as the color of the cursor when it is in a protected range. Have fun experimenting with different color combinations. Here is a chart of which colors the different hexadecimal digits stand for

0-black 1-blue 9-dark blue 2-erecn

A-bright green 3-light blue B-bright blue C-bright red

D-bright purple E-vellow F-bright white Bill Vera

Windsor, Connecticut

## 1-2-3/EPSON PRINTER CODES

Your readers might find it useful to have a list of 1-2-3 printer setup codes that will work with Epson FX, Epson MX, and IBM Graphics printers. They are shown in Figure 1.

By combining codes, up to a maximum of 39 characters, you can get just about any effect the printer is capable of producing. For example,

\#27\#R71\#274\#27\#71\#27\#69

#### SPREADSHEET CLINIC

will give you double-width, double-strike, emphasized italic.

John Moody Portsmouth, Virginia

Elite characters and proportional spacing aren't available on older Epson printers. but the other codes are common to them all. For other useful printer setup strings, see the next item.

#### DOUBLE-SPACED PRINTING In Spreadsheet Clinic (Volume 4 Number

24), you included an item on printing 1-2-3 spreadsheets double spaced. A better way to do this is to use a printer setup string to change your printer spacing. The codes vary from printer to printer, but for Epson MX, Epson FX, and IBM Graphics printers, the string \027A\024 initiates doublespaced printing

If you use this technique, it's also a good idea to reset the page length in 1-2-3 to 33 instead of 66 if you want to number the pages or include headers or footers. This is because 1-2-3 counts each doublespaced line as one line only and doesn't realize it's using twice as much paper.

John Sobotineie Erie, Pennsylvania

The string \027A\xxx lets you vary the line spacing in increments of 1/22 inch, where xxx is the number of seventy-seconds, from 001 to 085. In Mr. Sobotincic's example, 24/2 is 1/2, which gives you three lines per inch instead of the usual six. \027A\012, or 12/22 = 1/2 would be the default spacing of six lines per iuch. For even finer toning, you can vary line spacing in increments of 1/216 of an inch by asing the string \0273\xxx. where xxx can be any integer from 001 to 255.

I find it annoving when just a few lines of a spreadsheet spill over outo a second page. By tweaking the line spacing and page length, you can often keep the whole thing on a single page, and the line compression will hardly be detectable.

## CONCATENATING CELL ENTRIES Have you ever had to take labels from sev-

eral 1-2-3 cells and join them together in a single cell? If you have, you know how

Standard cheracters (18 per inch, 6 lines per inch)
Double-width to end of line (#28 cancels)
Raster reset code, printer returned to power-up state
Emphasized type (#27/#78 cancels)
Double-trike (#27/#78 cancels) NO CODE \014 \815 \027\864 \#27\#69 \027\071 Double-Effice (WZ/WZ cancels) Elito type, 12 per inch (%27) @88 cencels) 8 lines per inch (%272 cancels) Line spacing of 7/72\* (%272 cancels) 16.5 lines per inch (%272 cancels) Italics (%275 cancels) \827\877 \8278 \#271 \0273 \8274 All characters underlined (\827\8458 cancels) Superscript (\827\8848 cancels) \027\0451 \#27\#83# \827\8831 Subscript (\#27\#84# cancels) \#27\#871 Double-width (\#27\#87# cancels) \#27\1121 Proportional spacing (\827\1128 cancels)

Figure 1: 1-2-3 setup codes for Epson FX, Epson MX, and IBM Graphics printers.

in Figure 2 will do the work for you. To understand its operation, suppose you want to take labels from cells B24, B25, and B26 and put them together in cell C50. Run the macro by typing Alt-C<Enter>. It will successively prompt you for the addresses of the input cells. Enter the addresses B24, B25, and B26. When you have entered addresses for all the cells you want concatenated, answer the prompt with a number instead of a cell address. This tells the macro that you have finished with the input cells, and it will prompt you for the address of the cell where you want to put the concatenated output. Enter C50. The macro will go to that cell and write in the contents of the first three cells

The labels in the first column of Figure 2 are, of course, range names, which must be given to the cell to their right. INADD and OUTADD are deliberately left blank and will be filled in by the macro. The address H4 in the first and next-to-last lines can be any address that gives you a blank column to use as a work space.

This macro concatenates numbers as well as labels, and you can automate it to repeat the operation on a range of labels. Concatenation can be especially useful when you have stored names and addresses in separate cells but want to join them for printing address labels.

> W. J. Jhang Cerritos, California

The real brains in this macro are in the first line and the last two. The first line, which sets out the work space, writes an apostrophe (') at the top of the column, The rest of the macro then prompts you for cell addresses and stores their contents in individual cells below the apostrophe. The next-to-last line copies the contents of END (7xa) to the bottom of the storage column, sends control to the top of the column, and treats it like a continuation of the macro. Since there is an apostrophe at the top of the column, the macro types the whole column into the destination cell and enters it with the tilde ( \*) that came from the cell named END. As you will see if you ran the macro, you need that /xa, but it coald be an /xg instead if you want the macro to go on to do something else.

```
\c
                 /rncINLABEL 84 (goto) INLABEL " "
                 /xlAddress of first input ?"INADD"/xgNEXT"
/xlMext Addr? (AnyMonTeroNumberIfNoMore):"INADD"
{goto}INLABEL"(down)/rncINLABEL"(bs}"
LOOP
                 {goto}INADD~{edit}{home}{del}~
/xiINADD~& /xgLAST~
INADD
                 "INLABEL"/xiINLABEL=8"/xgLABEL"
{goto}INLABEL"{edit}{home}'{end} "/xgLOOP"
{goto}INLABEL"{edit} "/xgLOOP"
AlWhere do you want the output ?"OUTADD"{goto}
NEISE FO
LABEL
LAST
OUTADD
                 "/cEND" INLABEL"/xqE4"
END
```

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#### ■ SPREADSHEET CLINIC

WORD PROCESSING IN COLUMNS As a script writer by profession, I did not expect to use my spreadsheet program for much more than keeping simple business accounts. However, I have found it more

useful to me than the word processing programs I own.

The reason for this is that TV and video scripts are written in two columns, with visuals described on the left and accompanying parration on the right. To produce such a parallel format with most word processors requires using bothersome tabs and format controls, and rewriting is a real headache. While there are special scriptprocessing programs that format text in parallel columns, none of them gives you on-screen formatting. [A few, including XyWrite III, do-Ed.1

My solution is to use a spreadsheet. By defining columns of specific dimensions as text cells, I can see exactly what the

 While there are special script-processing

programs that format text in columns, only a few of them give you on-screen

formatting.

printed page will look like. With three columns set to widths of 38, 4, and 38 characters, I can type two columns with a four-

character gutter between them. A spreadsheet's column orientation and basic text-editing functions also let you cre-

ate interesting layouts for newsletters. Gerald Cooper Mount Holly, New Jersey

This is a good tip for all spreadsheet users no matter which program they own, 1-2-3 users can combine these ideas with the word processing macros suggested by J. David Highland in the March 11, 1986, Spreadsheet Clinic (PC Magazine, Volune 5 Number 5)

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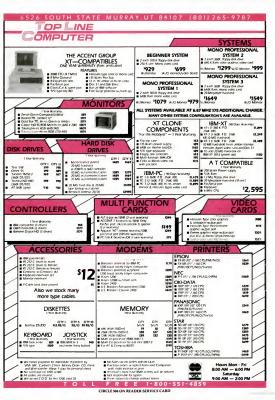
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#### EPSON MODE CHANGING

Switching between draft and near-letterquality (NLQ) modes on the new Epson LQ-1500 printer is cumbersome at best. One way is to go to the back panel of the printer and change the DIP switch settings, which is a nuisance. The print mode can also be changed through software, but even that method can be awkward without the right tools.

To simplify the change I wrote a short COM program to switch from draft to NIQ mode. You can create it for your own use with the DOS DEBUG program. After starting DEBUG from the DOS A> prompt, you will see a minus sign promet. (-) I suce an A (for assemble) command, and DEBUG's miniassembler will start your. COM program correctly at offset

Figure 1: This short program implements the codes for changing from draft to NLQ using the Epson LQ-1500 printer.

100H. (The four-digit value to the left of the colon will depend on your machine's configuration.) Enter all the (lowercase) commands shown in Figure 1 exactly as you see them printed.

After the last assembler statement, ener a carriage return by itself, then set the CX register to the correct number of bytes, as shown in Figure 1. Use the N (for name) command to name the file NLQ.COM, and use the W (for write) command to write it to disk.

The program works by using DOS Interrupt 21H, Function 5H, to send printer control characters to the printer. Three calls to Interrupt 21H are needed, one for each byte in the control sequence (1BH, 78H, and 01H) required to enable near letter quality on the LO-1500.

After you have written the file, you can set your LQ-1500 into NLQ mode by just typing NLQ from the DOS prompt. A similar command could be written for a different printer by using different printer control codes.

Raj Shinghal Aberdeen, South Dakota

MORE ON MODE CHANGES
The DOS MODE command lets you configure options for the asynchronous communications adapter, the display, and the printer. I often use it to set my printer to the condensed (132-column) format, but I always have to refer to the DOS manual to make sure I have all the MODE options enertied correctly. It would also be not if MODE had a way of setting my printer into enhanced (datened) mode printing.

Since MODE doesn't offer these options and is a pain to use anyway, I wrote two short. COM programs that make using my printer much easier. The first program, called DARK.COM, sets the printer to the "enhanced" mode of printing. The other program, called SMALL.COM, sets up

program, called SMALL.COM, sets up the printer to print in condensed mode. You can enter the programs with DE-BUG [see general instructions above— Ed.] as you see them in Figures 2 and 3.

Then use them by just typing DARK or SMALL from the DOS prompt. Gary D. Cochrell

Albuquerque, New Mexico

Power User readers submit tons of small
printer-control .COM programs like those
in Figures 1, 2, and 3, and each is very

useful—for a particular situation.

One of my own favorites simply issues a

```
A>debug
-n dark.com
-n dark.co
```

Figure 2: A shart program to invoke enhanced (dark) mode printing with Epson printers.

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### ■ POWER USER

A>debug ec xxxx:8188 mov dl,8f xxxx:8182 mov eh,85 xxxx:8186 int 28 xxxx:8186 ec cx

-r cx CX 8888 :8 -n smsll.com -w Writing 8888 hytes

Figure 3: This program will set Epsoncompatible printers to condensed mode.

page feed to the printer. I like to see a fresh top of form sitting in the printer when a printous starts. Indeed, if you have a laser printer, such a program is mandatory to get screen dumps and other less-than-fulltopge outputs to come out of the printer. If you want to make yourself a PAGE program, just change the 0f) in the first line of the program in Figure 3 to a 0c, and use PAGE COM in the Normmand.

You must be careful in using or modifying such programs, however, Gay Cochrell sprogram for setting condensed print, for example, like the MODE commended, works only with IBM- or Epsson-compatible matrix printers. Such so their printers use a 2- or 3-byte code parties, which uses only one. As a result, a program for such printers would wish up program for such printers would would be looking more like Raf Shinghal s program for setting the Epson UC-1500 to NUQ mode. Note that you would have to write the country of the program of the form they have been the country of the country of the country to the country of the country o

If your primer has a lot of options (and associated control codes) that you use less frequently, a more general program would accept the primer control codes as data and send them to the primer right from the DOS prompt. It turns out to be easier than you might think to create such a general-teed program. In the called this one PSET.



Figure 4: The assembly language source code for PSET.COM.



xxxx:0100 dad xi.cx xxxx: 0108 atd xxxx:818C mov dx, 1234 xxxx:010F cxl1 xxxx:0113 cmp al,28 811c xxxx:0115 jnx xxxx:0117 call xxxx:011A loop 013a al,30 xxxx: 911C xub xxxx:011E mul xxxx:0120 add al,bl xxxx; \$122 mov xxxx:0124 mov xxxx:0126 mul xxxx:0128 mov bl, #a bl,x1 8112 XXXX: 812A loop xxxx: 812C cx11 013a

xxxx:012F pop xxxx:0130 cmp xxxx:0134 jx dx,1234 ah, 85 xxxx:0136 mov xxxx:013A jmp xxxx:013C int 012£ 28 xxxx:013E pop xxxx:013F puxb bx xxxx:0140 puxh bx b1,81

www.8143 vor xxxx:0145 ret xxxx:0146 <juxt enter a CR hera> CX .46 -n past.com Writing #46 bytex

Figure 5: You can also create PSET.COM by entering this program in DEBUG.

dx,dx

PSET takes in the decimal ASCII codes as part of the command line and sends them to your printer. It's written in assembler (see the listing in Figure 4), and is small enough to enter using DEBUG (see Figure 5). Just in case you're not up to that, I've also supplied a BASIC program (Figure 6) that will create PSET.COM. All three versions are also available by modem 24 hours a day from PC Magazine's Interactive Reader Service at (212) 696-0360

PSET is slightly more complex and somewhat larger than single-purpose printer control programs. Its job is to scan the command line, looking for numeric characters that represent decimal ASCII codes. (Be careful when you use it, since it does not check for non-numeric characters-if you enter them, you may get strange results on your printer.)

As PSET finds each code (separated by blanks), it converts it to binary (internal) representation and pushes it on the stack. When the scan is done, the codes are popped off the stack and sent to the printer using Function 5H of DOS Interrupt 21H (just as the other programs da). A value of 1234H is pushed onto the stack at the beginning of the program for use as an "endof-stack" indicator. Since PSET scans from the end of the command line to the beginning, the control codes will be sent to the printer in the correct order when they are popped off the stack.

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```
' Program for creating PERT.COM
CLRIPKINT 'Chacking DATA; please wait..."
FOX R-1 TO 5
FOX C-1 TO 17
READ AS:IF CC17 THEN 168
      IN-IN-VAL (AS)
      NEXT: NEXT
IF 28-8979 THEN RESTORE: GOTO 288
FRIET "ERROR: CHECK THE LAST NUMBER IN"
PXINT "EACH DATA STATEMENT-THEN REDO": END
      FOR B-1 TO 5
FOR C-1 TO 18
READ AS:TTL-TTL-VAL("6x"+AS)
       NEXT

BEAD X:1F S-TTL THEM 278

PXINT "DATA ERROR IN LIMX";8"18+338

FRINT "COECE FIGURES AND REDO":END
      349
```

#### POWER USER

You can create PSET.COM using the Macro Assembler, DOS LINK command, and EXEZBIN to convert PSET.EXE to PSET.COM. You can also enter it using DEBUG (Figure 5) or BASIC (Figure 6).

DEBUG (Figure 5) or BASIC (Figure 6).
After you've created PSET.COM, the
easiest test is to have it print a few ordinary
characters (the program doesn't care that

■ MicroPro's instructions for installing *CorrectStar* on Version 3.3. of *WordStar* are straightforward enough, but if you're using DOS 3.x,

they simply don't work.

they're not control codes) and then issue a form feed to bring in a new page of paper.

Try this, for example:

APRIARE #8 67 32 77 97 183 97 122 185 116 181 13 12

Once you've got this working, you can issue any printer control codes you want. You could, for example, replace Raj Shinghal's program with the following PSET command:

#### A>pset 27 120 1

If you find that you use the same PSET command frequently, you can either put it in a .BAT file and continue to use PSET, or you can make a .COM file of your own similar to the ones that are printed in Figures 1, 2, and 3.

—John Dickinson

## CORRECTSTAR CORRECTION

MicroPro's instructions for installing CorrectStar on Version 3.3 of WordStar are straightforward enough, but if you're using DOS 3.x they simply don't work. All you get is an error message stating that CorrectStar can't find the internal dictionary. The following patch fixes the installation problem. Put a disk containing DEBUG in drive A: and a copy of CorrectStar in drive B:. At the A: prompt, type

DEBUG B: CORRSTAR. OVR<Enter>
At DEBUG's hyphen prompt, enter the following lines:

E1242<Enter>\*
7C<Enter>\*
WEnter> (to write the change to disk)
Q<Enter> (to quit DEBUG)

After this change, follow the rest of the installation instructions carefully, and CorrectStar will work like a charm. Marc R, Schumer

Franklyn Park, New York

This patch works for CorrectStar 3.31 under both DOS 3.0 and DOS 3.1. But CorrectStar 3.30 needs a slightly different patch. With CorrectStar 3.30, begin as above. After typing 7C<Enter>, add two more lines. At the prompt, type

E3CØ <Enter> 9Ø <Enter>

Then conclude, as before, by typing W to write the change to disk, followed by Q to auit.—M.David Stone

## POWERS AND LOGS

I was disappointed to learn that Turbo Pasad did not have a generalized exponentiation (that is, raise to a power) operator, so I wrote an exponentiation function using Turbo's exp and 1 in functions. Another useful function computes logarithms. Turbo offers the 1 in function, which handles only base e. The log function I wrote handles all positive bases. Gary Later Buellton, California

Gary Later's two functions are demonstrated in the short program shown in Figure 7. Although Turbo Pascal does not include all the math functions you may need, it senerally does supply the core functions.

Turbo Pascal includes sin, cos, and arctan functions, but you can derive other trigonometric functions using wellknown identities

which can then be usefully combined as Mr. Later has done. For instance, Turbo Pascal includes sin, cos, and arctan functions, buy ou can derive other trigonometric functions using well-known identities. —Charles Petzold

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```
Frogram PowerLegs

Wis R. I. Bank, T. Bendl, Bendl Ben
```

Figure 7: This demonstration program shows generalized power and log functions that use the built-in Turbo Pascal functions exp and ln.

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# **USER-TO-USER**

PC Magazine's readers share their favorite tricks for getting the most horsepower out of DOS. BASIC, and their systems in general.

INSTANT UPDATES

The technique in User-to-User, Volume 4 Number 21, for updating directories forces DOS to rewrite an entire file to disk. While this does work, it's more efficient to rewrite just the directory listing. My early model floppy-based PC took 34 seconds to update a 240K file using the older method.

I've written an assembler program called UPDATE. COM that will undate the same 240K file in less than 3 seconds on the same system. UPDATE.COM searches for specific filenames, retrieves the system date and time, converts these to the format used by the DOS directory, and then writes the updated information back to the directory.

Create UPDATE.COM by running UPDATE BAS in Figure 1. Then, to run the program, type UPDATE filespec, where filespec may include a valid drive and subdirectory path. However, UP-DATE.COM will not accept wildcard entries (such as ? or \*).

If you wish to backdate or future-date a file, you can create a batch file called RE-DATE BAT that contains the lines

echo off date update %1

Enter the REDATE filespec and answer the date and time prompts accordingly. If your system has a clock, you can end with an instruction to reset the clock to the proper date and time

Peter Lilewellyn

While the program won't handle wildcards. DOS will. If you want to update eyery file on your disk, for instance, simply create a short batch file called UPDTALL .BAT, based on the FOR subcommand. that contains the single line

FOR %%F IN (\*.\*) DO UPDATE %%F

What really gives this power is that you can substitute other ranges between the parentheses; for instance, a "(\*.BAS)" will update all the BASIC files.

188 'UPDATE.BAS -- creates UPDATE.COM -- by Peter Llewellyn 118 CLS:PRINT "Checking DATA; please wait ... 128 FOR B=1 TO 17:FOR C=1 TO 17 130 READ AS: IF C<17 THEN 150 148 Z#=Z#+VAL(A\$) 158 NEXT:NEXT 168 IF 20=26401 THEN RESTORE: GOTO 198 178 PRINT "Error: Check the last number in" 188 PRINT "each DATA statement -- then redo":END 198 FOR B=1 TO 17: FOR C=1 TO 16 288 READ AS:TTL-TTL+VAL("4H"+AS) 210 NEXT 228 READ SS:IF VAL(SS)=TTL THEN 258 238 PRINT "DATA error in line ";B\*18+388 248 PRINT "Check figures and redo": END 250 TTL-0:NEXT:RESTORE 260 OPEN "UPDATE.COM" AS #1 LEN=1: PIELD #1,1 AS DS 270 POR B=1 TO 17: POR C=1 TO 16 200 READ AS: LSET DS=CHRS(VAL("6H"+AS)) 298 PUT \$1:NEXT:READ DUMMYS:NEXT:CLOSE 388 PRINT "UPDATE.COM Created":END 310 DATA EB,53,90,0A,0D,4E,6F,20,41,72,67,75,6D,65,6E,74,1541 328 DATA 28,45,6E,74,65,72,65,64,80,8D,52,65,2D,65,6E,74,1321
338 DATA 65,72,28,77,69,74,68,28,76,61,6C,69,64,28,66,69,1498

358 DATA 65,6E,74,28,46,69,6C,65,28,6E,6F,74,28,66,6F,75,1474
368 DATA 6E,64,8A,8D,24,BE,88,88,BF,B8,88,8A,8C,88,F9,88,1481 378 DATA 75,83,89,8F,88,46,88,84,3C,21,74,27,3C,23,72,26,1283 388 DATA 3C,52,76,1F,3C,20,72,18,5C,3A,76,17,3C,46,72,16,1818 399 DATA 3C,5A,76,8F,3C,5C,74,8B,3C,5E,72,8A,3C,7E,76,63,11818 488 DATA EB,84,98,88,85,47,FE,C9,88,F9,88,75,C8,C6,85,88,1947 418 DATA BA,B8,88,78,F8,B9,21,88,88,88,48,CD,21,3C,88,75,4E,1583 428 DATA B4,2A,CD,21,81,E9,BC,87,8B,C1,B1,84,D3,E8,82,C6,2165 438 DATA 88,D4,88,FE,C1,D3,E8,82,C2,88,D4,88,58,B4,2C,CD,2267 440 DATA 21,08,C1,B1,02,D2,E8,FE,C1,D3,E0,50,B8,60,3D,BA,2371 450 DATA B0,60,CD,21,08,D8,59,5A,B8,61,57,CD,21,B4,3E,CD,1965 460 DATA 21,EB,12,90,BA,03,01,B4,09,CD,21,EB,00,90,BA,39,1677 478 DATA 81,84,89,CD,21,CD,28,88,88,88,88,88,88,88,88,88,665

348 DATA 6C,65,73,78,65,63,0A,8D,24,8A,8D,41,72,67,75,6D,1226

Cape Town, South Africa Figure 1: Program to create UPDATE.COM file time- and date-stamp updating program.

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#### USER-TO-USER

STAMP.BAS -- Auto Date-Time stamper -- by Bruce McDonough II Last Run Date [ddddddddddd]

110 Last Run Time{ttttttt}} 128 138 GOSUB 148: END

148 DEF SEG: C-PEEK(\$H38) +256\*PEEK(\$H31):L-18:A\$-DATE\$
158 IF PEEK(C)=123 AND PEEK(C+L+1)=125 THEN 168 ELSE C-C+1:GOTO 158 168 FOR I=1 TO L: FOKE I+C, ASC(MID\$(A\$,I,1)): NEXT: C=C+12 178 IP L=18 THEN L=8: A\$=TIMES: GOTO 158

188 SAVE "STAMP 198 RETURN

Figure 2: Program to date- and time-stamp BASIC pragrams automatically.

#### FREE STAMPS

The STAMP.BAS program in Figure 2 will automatically update the date and time in its own REM statements each time you run it and then write the new information to disk

The program first looks for the beginning of the program in memory by peeking at addresses &h30 and &h31, then searches memory for the { } brackets. Once it's found them, it pokes the appropriate bytes of date and time into memory and saves the changed program.

Bruce McDonough II Escondito California

The subroutine in lines 140 through 190 can be put into any program to add the current date and time automatically. If you do this, he sure to insert an initial (dddddddddd) and (tttttt) near the beginning of the program. Afterward, each time you run the program the subroutine will log your use. The DOS directory listing will log the creation or change of a file, but not its normal running.

## BEST BATCH BRANCH

I've noticed that very long batch files containing numerous "if . . . goto" conditional statements tend to slow down dramatically as processing moves further along. DOS searches slowly for each new label from the top of the file, yielding a pathetic 5- to 10-second delay, even on an AT, if the label occurs near the end of a long batch. But I've discovered a way to get rid of all the labels and "if errorlevel , goto" statements, allowing a batch file to work at top speed and still contain numerous conditional branches

I can control most batches with a simple Y(es) or other single-key response to each request. Unfortunately, the GETKEY technique described in an earlier User-to-

User sets a different errorlevel for every response. Because DOS returns a "true" if errorlevel <= the set value, batch files ordinarily require four "if errorlevel" tests to obtain "true" on Y or v but "false" on other keys.

The short GETYES.COM program in Figure 3 performs these tests, thereby removing them from the batch. It sets errorlevel 255 for Y or y and errorlevel 0 for any other key. This lets you directly perform an operation with the statement "if errorle-

vel 255 (perform some DOS function)". I've also found that you can nest "if" conditionals on one line of a batch file for further flexibility and control; for example, "if errorlevel 255 if exist filename (perform some DOS function)" or "if errorlevel 255 if x==%1 (perform some DOS function)". This doesn't seem to be documented in the DOS manual.

> Robert J. Holmgren New York, New York

MOV AH,88 INT 16 CMP AL,59 JZ 818C CMP AL,79 JNZ 818E MOV AL, PP MOV AH, 4C INT 21

N GETYES.COM RCX 12

Figure 3: Script for creating GETYES.COM.

Type this program using the DOS COPY CON: command or a pure-ASCII word processor and name it SCRIPT. Be sure to include the blank line after INT 21, and hit the Enter key after each line, especially the last one. Then put DEBUG (Version 2.0 or later) on your disk and type DEBUG<SCRIPT.

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## ■ USER-TO-USER

This rechnique makes batch branching a pleasure rather than a chore. You can create GETYES. COM by typing in the SCRIPT file in Figure 3 and then patting it on the same disk with any version of DE-BUG 2. Or later and typing DEBUG SSCRIPT. Or you can use the BASIC program in Figure 4.

If you want to use N and n rather than Y and y to trigger errorlevel, simply substitute 4E and 6E for 59 and 79, and chunge the reference from GETYES.COM to GETNO.COM. To test this after creating the GETYES.COM program, type in the

batch file (and name it TESTTHIS BAT):

echo off

exit

echo Hit y or Y or another key getyes if errorlevel 255 goto :yea goto :no

íyes echo ...you said yes

goto :continue

echo ...you didn't hit y or Y continue echo Now, want to quit (y/n)? getyes if errorlevel 255 goto :exit goto :8tart The nesting abilities described by Mr. Holugren allow even more power. To test these, revise the fifth line of TESTTHIS BAT to read

if errorlevel 255 if Z==%1 goto :ves

Then, if you execute TESTTHIS.BAT ignals, hitting Y or y at the first prompt will not result in a brunch as it did earlier. To make both of the nested conditions true, instead of executing the batch file by typing TESTTHIS, at the DOS prompt type

#### TESTTHIS Z

and then hit Y or y when asked. The Z after the filenane will replace the %! parameer, and since both conditions the errorfevel and the Z = 22) are true, the batch file will work as advertised. If you ray this, be sure to type in a capital Z; DOS, which much of the time converts lower-case keyboard inputs into upper-cuse ones, is casesentitive here.

188 ' GETYES.BAS -- creates GETYES.COM 118 OPEN "GETYES.COM" AS \$1 LEN=1

126 FIELD #1,1 AS D\$ 136 FOR B=1 TO 18

148 READ AS:LSET DS=CHRS(VAL("4H"+AS)) 158 PUT #1:NEXT:CLOSE

168 DATA B4,88,CD,16,3C,59,74,84,3C

Figure 4: GETYES.BAS program for creating GETYES.COM.

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#### VOLUME PLEASE?

Although it's not documented, it's possible to change the volume label of a disk under DOS 2.1. The trick uses DEBUG to load the directory, changes the volume label, and writes the directory back.

First, load DEBUG.COM (by typing DEBUG). Once you see the hyphen prompt, type

#### L 100 0 5 1

Then hit D to dump the contents, showing the label at &h 160. Type the following line, where "labelname" is the new name you want (be sure to make this new name exactly 11 characters; if it's shorter, add spaces at the end to pad it out):

#### E 160 "labelname

Then, to write the revised directory back to the disk, type

W 100 0 5 1

Finally, hit Q to exit DEBUG. Note: Using this method will also allow otherwise illegal characters such as a peri-

od or small letters.

#### Nathan Eide Jackson, Michigan

Well, sort of. The instructions above are only for a flappy disk in drive A: that has just three fles on it (presumably the two system fles IBMBO.COM and IBMDOS. COM, and COMMAND.COM) plus the volume label. A gutted version of the DE-BUG dump of such a disk's directory would look something like this (ignore the xxxx at the bevismine of each thin.

xxxx:0100	IBMBIO COM'
xxxx:0110	'pq\8
xxxx:8128	IBMDOS COM'
xxxx:0130	4apl
xxxx:8148	COMMAND COM
xxxx:8158	ng. ( Z
xxxx:0160	LABELNAME (
xxxx:0170	

However, to your system, a volume label is simply on effectory enty ledit in a special way. DOS uses the 12th byte of the directory listing (actually byte 11, since the first byte is byte 0) to mark the first in the six of the order of order of the order of the order of the order order

The value of the attribute byte for LA-BELNAME in the above example is 28, which means that it is a volume label and that the archive bit is set. However, LA-BELNAME doesn't have to be the fourth entry in the directory. It will be the fourth entry if you format a frieth disk using the IS option for if you format it without IS but then immediately use SYS to transfer the system files), and then immediately add a

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#### USER-TO-USER

volume label. But the volume label could be anywhere on the directory.

If it is the fourth entry, you will indeed find it at address &h160. But if you don't have system files on your disk, the label could be at a lower address. And if you add the label after creating several files, the label could be at a higher address. To find it, after using the DEBUG L command to load the directory, use the D command to examine the twelfth bytes-and look for a

value of 8 or 28. But be very, very careful, Note that DE-

## The 12th byte will tell DOS whether a file is

a hidden file, a system file, a read-only file, etc.

BUG refers to drive A: as drive 0, drive B: as drive 1, etc. So "L 100 0 5 6" would mean "load six sectors of drive A: starting with sector 5-all into memory starting at address 100." The W (write) command uses the same format. It's simple to type in an errant value and write a scrambled directory back to your disk. So if you try this, do it on a copy of a floppy disk only. And to be perfectly safe, don't ever write to a hard disk unless you're really sure of yourself and have a perfect backup copy handy.

And anyway, get with it. IBM and Microsoft keep revising DOS so you don't have to resort to such shenanigans. Recent versions of DOS supply you with a LABEL utility to do what you want. And while your method does allow you to put illegal characters in the volume name. DOS will probably be confused by it.

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# PC TUTOR



PC Tutor answers your questions on everything from programming and operating systems to hardware and applications software.

## EXTRA MEMORY FOR BASIC

I am trying to develop a multipage screenbuffer technique for my monochrome display that will provide a function similar to the color adapter's ability to keep several different screen images stored in memory and flip them to the screen when appropriate. Using an assembler subroutine, I've been able to use the highest 12K when running with the BASIC interpreter. However, when the same program is run in compiled form (with appropriate changes such as CALL ABSOLUTE), my machine goes utterly berserk! It appears that I need to reserve a portion of memory. Is there a way to do this using the memory-management DOS function calls (48h, 49h, and 4Ah) in DOS 2.1?

William C. Alston Roswell, Georgia

Getting access to a chunk of memory to use within interpreted and compiled BASIC programs is a common problem.

Programs compiled under the old IBM and Microsoft BASIC compilers use all available memory from the beginning of the program upward. Since these compilers were designed to work under DOS 1.1, they do not free up any of this program memory asing function call 4Ah. Consequently, a function call 48h from within an assembly language routine will not allocate a memory block since there is no memory left to allocate.

Nor could you first deallocate some of the compiled BASIC's memory with an assembler subroutine using function call 4Ah, because the program has already set

itself up in the memory and expects it all to be usable. There are a couple of solutions to your

problem, however Under the BASIC compiler you could

define a string variable 4000 bytes long to hold the monochrome display contents with the following statement:

MONOHOLDS = STRING\$ (4000.0)

You could then use VARPTR to pass the address of this string to your assembly language subroutine. (Note that the first 2 bytes pointed to with VARPTR (MONO-HOLDS) contain the length of the string. which is 4000.) However, this would not work under the BASIC interpreter, whose

strings are limited to 255 bytes.

If you'd like to keep the compiled and interpreted BASIC programs consistent in the way they store data in upper memory, therefore, you need to prevent the compiled BASIC program from taking up all of

 Programs compiled under the old IBM and Microsoft BASIC compilers use all available memory from the start of the program upward.

available memory. This can be done by modifying xome of the header information in the compiled .EXE run file, though, as you'll see there may be some problems in this approach.

Every .EXE file begins with header information DOS needs to load the program into memory, perform segment fix-ups, and allocate space for it to run. This header information is documented in the DOS manuals for Versions 2.0 and earlier and in the DOS Technical Reference manuals for Versions 2.1 and luter.

You can't see this header information if you load the .EXE file directly into DE-BUG, because DEBUG uses the header to perform all the space allocation and fixups, making the program all ready to run. You'll have to first rename the file to an extension other than .EXE and then load it into DEBUG. (But then you won't be able to run it in DEBUG, so don't try.)

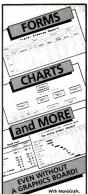
Use the following commands to look at the first part of an .EXE file header:

RENAME runfile.EXE runfile.XXX

-N runfile.XXX -I. Ø

-D Ø

The 2-byte word beginning at offset 000Ah is defined in the DOS Technical Reference manual as the "minimum number of 16byte paragraphs required above the end of the loaded program." This word will often be ut offset 0000h. The 2-byte word at offset 000Ch is the "maximum number of 16byte parugraphs required ubove the end of the loaded program." This will usually be



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#### PC TUTOR

FFFFh, which means that the program wants all available memory above where it loads.

This extra memory space is used for the "heap" and the "stack." During calculations, for instance, the stack is used to store intermediate results. The heap is used by the program mostly for dynamic storage. If your program executes a STRINGS command such as I've shown above, or if it DIMensions an array, the result has to go somewhere. It goes in the heap. In a program that does a lot of dynamic string and array allocation, the heap can get pretty cluttered up and disorganized. At times, normal execution can grind to a halt while the program cleans up the heap in a process technically referred to as "garbage collection."

Of course, most compiled BASIC progrand can flunction normally with less. Thus, you can change the "maximum memory" word at offset 000Ch in the .EXE header to something lower than FFFFh to prevent DOS from allocating all available memory to the program.

available memory to the program.
Let's assume, for example, that you have 256K memory in your machine and that the bottom 128K memory is taken up by DOS and resident programs. (You get this second figure by subtracting the "hytes Fee" from the "hytes tool memory information provided by CHKDSK, 1ff your .EXE program is about 32K, you can give it anothed visible at 18 your fixed from the state of the providence of the provid

To do this, you'd enter the following DEBUG commands as a direct continuation of the program shown above (whose last line was -D 0):

-E ØØØC ØØ 1Ø -W

-Q RENAME runfile.XXX runfile.EXE Note that the 2 bytes (00 and 10) specified

after the E (Enter) command are in reverse order, as usual. The actual word you've entered is 1000h or 4 096 decimal. This is the number of 16-byte paragraphs, and it corresponds to 64K bytes.

When you now run your .EXE program, the DOS loader uses this "maximum memory" word in the .EXE header to compute a "top of memory" word (also in paragraph form) that it puts in offset 0002h of the program's Program Segment Prefix. The compiled BASIC prologue uses this value to limit the amount of memory it uses.

You can look at the Program Segment Prefix by loading the EXE file (not the renamed XXX file) into DEBUG and executing the command

-D 6

If an .EXE header has FFFFh in offset 000Ch, the Program Segment Prefix top of memory word at 0002h will be 4000h for a 256K machine and A000h for a 640K machine (again, you'll see the 2 bytes shown

## The .EXE file header contains a word "checksum" value.

which is supposed to be used by the DOS loader to ensure .EXE file integrity.

in reverse order). If the amount of real available memory exceeds the leight of the program plus the additional memory (plus the memory taken up by DEBUG), then you'll see a lower value. If you have enough high memory for screen swaps while in DEBUG, you'll certainly have enough when running the program outside of DEBUG.

How low can you set the value at 0000Ch in the EXE header? Definitely don't set it to 0—that indicates to DOS that the program is to be loaded high in memory, and it will crash. With some compiled BASC programs on the loaded high in memory, and it will crash. With some compiled that I view is to be a source of the control of the contr

slower, since it has to perform more fre-

quent garbage collections to clean up the heap. (This is not an abstruse concept for those of us who live in small apartments.) You'll probably have to experiment to get an optimum value.

If you do your compilation and linking using a batch file with a replaceable parrameter for the filename, you can automate this .EXE header modification with the following batch file code after the LINK.

RENAME \$1.EXE \$1.XXX DEBUG \$1.XXX <HEADCHG RENAME \$1.XXX \$2.EXE

where HEADCHG is a file containing the DEBUG commands

E Ø1ØC ØØ 1Ø W

Note here that you have to use 0100h plus the header offset for the E (enter) command because DEBUG is loading the file at offset 0100h.

The EXE file header also contains a word "checkam" value, which it supposed to be used by the DOS loader to ensure EXE file integrity. If we change a value in the header, then the checkum will not check. However, DOS doesn't use this checkum when loading programs. If it does in the future, you'll have to make an addistinent to that value as well.

You may also be interested to learn that the LINK program included with the Mi-crosoft (but not the IBM) Macro Assembler and the Microsoft C Compiler includes a switch called CPARMAXALLOC to set the maximum memory value during the LINK so you don't have to adjust it later. The new version of the Microsoft C Compiler also has an EXEMOD program to change this header information with a one-line command.

(People sick and tired of having COM-MAND.COM reload after running a compiled BASIC program may alter this word to prevent the program from overwriting the transient part of COMMAND.COM at high memory.)

Although there's nothing wrong with modifying this part of the .EXE header, you may have problems using memory above the loaded program.

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## PC TUTOR

First, the value you pick to go in the .EXE header will probably be dependent on your machine's memory configuration. If it's run on a machine with a few more resident programs loaded, you may not have enough high memory to store your screen swams

Second, in a multitasking system such as TopView, this solution will be absolutely disastrous, because your program is using memory that doesn't belong to it. Only memory up to that top of memory word in the Program Segment Prefix is allocated for your program, and you are deliberately using memory higher than that. Top-View may be using this memory for some other program. The same problem exists if you use high memory in the BASICA interpreter

You also don't want to write over the first few bytes right after the top of the extra memory, because these contain a marker DOS uses for memory allocation.

Is there another solution? Yes, but it would require using a separate assembly language program to allocate memory below your loaded program. This assembly language program would perform the following four steps: (1) deallocate all memory above its code by executing the DOS 4Ah function call; (2) allocate a block of memory for screen swans (or BLOADs or whatever) with function call 48h: (3) store the address of this block in lower memory, probably in one of the user interrupt vectors beginning at 0000:0180h; (4) load the compiled BASIC program (or the BASICA interpreter) using the EXEC function call 4Bh.

The BASIC program-in either interpreted or compiled form-could retrieve the address of the allocated memory block using PEEK and pass this address to the assembly language subroutine. When the BASIC program terminates, control would pass back to the assembler program that loaded it, which would then terminate. If enough readers are interested in see-

ing such a program, perhaps I can cover it in a future PC Tutor column.

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BY VICTORIA DANOFF

Word processors aren't the only way to edit files. For some applications, they aren't even the best way. If you do more editing and copying of such text as programming code, for instance, than you do actual word processing, you need Point, a powerful mouse-driven text editor from Lemma Systems. By using a mouse, you can save a lot of editing time by pointing at commands rather than typing them

or hitting specific keys. Point requires either the Microsoft or the Mouse Systems mouse driver and mouse. All of Point's power comes from this mouse interface. Typing-oriented users who have never used a mouse (myself included) will be amazed at how easy it is to move, copy, delete, search, change windows, and so forth, by pointing at text, windows, and commands. There's even a helpful mouse command chart in the manual that you can rely on until you get the hang of how to use the two mouse buttons for maximum power. Though I've become enamored of the mouse, it does take a while to become a mouse lover if you've been weened on a keyboard as I was. Point obviously takes this "adjustment period" into consideration because you can also use the keyboard to execute all

commands. To access Point, you put the program disk into drive A: and type "pt filename" to get one file to come up with the program. You can type in up to 20 filenames (8 is the default), and they will all be called up to the screen with the program. You type /h, /v, /s, or /o after "pt" and before the filenames if you want the files to appear in horizontal, vertical, stepping, or overlapping windows instead of in full-screen mode. The program's manual and tutorial are useful for learning how to take advantage of all of Point's features, though the wording may be a bit confusing to some at

Point couldn't possibly be more flexible. You can use it as it is or customize it to meet your editing requirements. You can edit up to 20 files (no length limit) in 20 windows, and with a click or two you can create a new window; zoom, stretch, or change the window size: or delete a window. If you don't like the list of commands in the top line on-screen, you can change the lineup. Or change the command names altogether. Most programs make you adapt to their ways, but you can make

Point work your way. Among the program's features are an undo option that lets you undo editing actions such as deleting or copying text, and a DOS Command Processor that allows you to get to the DOS prompt from within the program without quitting. Point also offers speedy shortcuts for experienced users, such as mouse-sensitive window parts and user-definable menus for fre-

quently used commands. Point's "undo last edit" option in the edit menu is quite amazing. Unbelievably, the manual boasts that Point can undo up to 200 edits with its "undo, erase history" option. I can't imagine ever wanting to undo that many changes, but I did try to undo 20 edits. It took awhile because I had to keep going back up to the edit menu. but it worked. Point undid everything I had done, restoring a file—one undo edit at a time to its preedited version right be-

The program's color chart in the options menu is fun and easy to use. You use the mouse to point to a color square, and it appears instantly in the designated area. You can select a different background and text color for every part (border, command line, error messages, file text, and so on) of each of the 20 windows. If you want to use the same colors every time, you can put the codes into the program's

installation file. Point can be a powerful and flexible tool for programmers and others who edit multiple files and don't need word processing features. (By the way, you can edit text files originally created by any word processor. but the files will show all of your word processor's formatting codes, which are ignored by Point.) However, Point's usefulness is based almost entirely upon a mouse. With a mouse, it's fast and useful. Without it, Point is just so-so.

FACT FILE

Lemma Syst 312 Sierra Pl. NE Albuquerque, NM 87108 (505) 265-0133 List Price: \$125 Requires: 196K RAM, two

disk drives, DOS 2.0 or later, digital mouse. In Short: A powerful and flexible mouse-driven text editor that

allows you to simultaneously edit multiple files. CIRCLE 647 ON READER SERVICE CAR

## IDEAssociates Diskit: Plua 'N Go Drive Kits

BY BILL MACHRONE IDFAssociates's new Diskit add-in hard disk arrived at PC Magazine's offices right in the middle of a crisis. Executive editor Paul Somerson was fuming because his PC AT had once

again expired. He was trying to make do with a PC Portable and ranting about the uselessness of two floppy drives and no hard

disk. I opened the Diskit's packaging and found a 20-megabyte half-height drive and controller



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inside. (Hey., IDE: You put the controller card uppermost in the foam packaging. Some clod is going to use it as a handle to get the drive out. Include unpacking directions right in the box.) Without further ceremony I barged in or Paul, disassembled the PC Portable, ripped out the half-height B. vive, and botted the Diski in place—cursing IBM all over again for its astimulation of the complex of the processing of the complex of the processing of the process

We got the Portable back together and booted up. A CHKDSK C: showed that the drive was already formatted and ready to go. We SYSed drive C:, copied COMMAND.COM over, reset, and watched as it booted from the Diskit drive.

Then we read the directions.

The Diskit drives come in a variety of disk capacities (10 to 120 megabytes) and drive configurations (fixed or removable cartridge), with a controller card that can handle up to two drives. The 20-megabyte drive we installed finade by Seasate)

clocked in at 75 milliseconds on random seek, a respectable per-

I started the installation at noon. Paul was smiling again by 1:30 p.m., and we'd spent half the time looking around for the right tools. Nice work, IDE.



Diskit Add-in Hard Disk IDEAssociates Inc. 35 Dunham Rd. Billerica, MA 01730 (800) 257-5027

(800) 257-5027 (617) 663-6878 List Price: XT-compatible 20-Mbyte drive, \$1,195; standard 10-40-, 70-, and 120-Mbyte drives and a removable 10-Mbyte drive for XT or AT,

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## Crystal 300 Power Conditioner: Clean, Forgettable Power



BY BILL MACHRONE

The best thing you can say about Curtis's Crystal 300 Power Conditioner is that it's utterly for-gettable. Though we've tested it over the last several months, we have for the most part managed to remain bilistfully unaware of its presence. The Crystal is a 300-watt power conditioner that 300-watt power conditioner that of the condition of the

such a device were immediately noticeable on executive editor Paul Somerson's Enhanced Graphics Monitor, which had been plagued with constantly changing image size as voltages in our offices fluctuated from copiers, printers, and the like. With the Crystal in place, the image was rock-solid.

image was rock-solid. While the Cypert supply, it was to an uninterruptible power supply, it would look like interruptions to your computer. We had one such dropout a few weeks ago. Senior editor Bill Howard had the Crystal hooked up to his Compaq Deskpro. The lights flickered for an instant. A choras of epithets issued from editors' offices as every machine to the compact of th

## askSam: Destructuring Your Database Files

BY BARBARA KRASNOFF

askSam, from Seaside Software, is one of a new senre of database management programs hitting the market. These new systems are based on the premise that users don't want the heavily structured formats that DBMS software has provided up to now. Instead of making you try to fit data into fieldbased records, askSam treats every screenful of data as a record. If you can type text onto a screen, you can put any kind of information in any order into any record and still be able to recall it when you need it. By including various tags and labels within the text, you can format, sort, select, and print the infor-

mation later.

Of course, such flexibility has its corresponding price, Because it is such a text-oriented, free-form system, askSam does not offer the immediate case of use of structured, mena-oriented systems. Though there is a help system, it is not at all context-sensitive, so you'll need to thumb through the accompanying manual quite a bit in the beginning. Also, since the pro-

gram works on text, operations such as sorting may prove unbearably slow for large files. Yet the unique formless format of askSam can lend itself to

more creative use of database information: You can adjust cach record to your own formatting needs—from a fill-in data form to a screenful of extemporaneous text—in one file. For example, you can list keywords horizontally along each row of a screen in one record, with a structured data-entry form in the next. It doesn't matter to the program, which treats each resort as

Business database users with heavy data flow and organized data-entry operations will probably be happier with a more traditional and powerful product. But if you are not comfortable or satisfied with the usual structured DBMS. askSam is an interesting alternative.

cord exactly the same.



538 Parade Dr. Corpus Christi, TX 78412 (800) 3-ASKSAM List Price: \$149,95 Requires: 128K RAM, one disk drive, DOS 2.0 or later. In Short: A text-based database manager that's a viable alternative to structured DBMS software. Non-copy protected.

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genteel lifestyle in PC Labs, where it supplies a constant voltage for all the monitors under test to ensure consistent, repeatable measurements.)

Unlike most CVT-based conditioners, the Crystal sports a meter that indicates load. You won't need to refer to it often, but it's interesting to see the gross fluctuations in power as a computer warms up. If you're going to regulate the power to your PC and several peripherals, the meter also lets you know when you're about to exceed ca-

All in all, the Crystal 300 is forgettably memorable.



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What's it like to use it? If you have ever worked with or seen a RAM Disk you know what a difference speed can make when working with any program that frequently accesses the disk. Well, LIGHTNING enables those programs to approach the same rapid speed as a RAM Disk, but it does it without the disadvantages. With a RAM Disk there is a constant danger that you can lose your precious data if you forget to copy it back to the disk drive. With LIGHTNING you just use your programs normally. You don't have to remember any-

LIGHTNING has a fun feature that shows you just how fast you're operating. Any time you want, with a couple of keystrokes you can see a screen that keeps a record of how many times you've accessed the disk, and how much time LIGHTNING has saved you. It's fun to check it out, and it's always astounding. Speed-up varies, depending on your application, frequency of disk access, and amount of RAM you can allocate. For example, best results occur with indexed databases,

When you work with a database program or most word processors, or any time you need to frequently load files into RAM or save them back, you are accessing your disk. It is such a pleasure to cut those times

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